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Crash Outcome Data Evaluation System (CODES)

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Crash Outcome Data Evaluation System
(CODES)

October 1998

National Center for Statistics and Analysis
National Highway Traffic Safety Administration
400 Seventh Street, SW, Room 6125
Washington, D.C. 20590

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1.0 INTRODUCTION

1.1 Purpose of the Catalog

The purpose of the *Catalog of Types of Applications Implemented Using Linked State Data (CODES)* is to inspire the development of new applications for linked data that support efforts to reduce death, disability, severity, and health care costs related to motor vehicle crashes. The document is divided into three sections. The Introduction describes the purpose of the Catalog, the evolution and components of CODES, and the CODES states. The Background section discusses data resources and case selection, issues related to “as reported” data and the linkage process, and the organization of information included in the catalog. The final section presents abstracts of some of the types of state-specific applications developed or in process to date. NHTSA will update the catalog on a periodic basis as the newly funded CODES states develop new applications. This version of the Catalog includes applications developed as of October, 1998.

1.2 Evolution of CODES

The Crash Outcome Data Evaluation System (CODES) project evolved from the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 which mandated that the National Traffic Safety Administration (NHTSA) report to Congress about the benefits of safety belts and motorcycle helmets in motor vehicle crashes. Benefits were to be measured in terms of reductions in death, disability, and medical costs. Since none of the crash and various injury state data files contains sufficient information to identify the specific crash, vehicle, and behavior characteristics that make a difference to outcome, NHTSA determined that only linked statewide data could provide the necessary outcome information for all persons involved -- those who were injured or who died and those who were not injured. Using these data, comparisons between those using and not using safety belts or motorcycle helmets could be made by identifying and contrasting the characteristics of the injured and uninjured persons within each of the use groups. Also by using state data, the linked data could be used to support state specific purposes and could be disaggregated to support safety efforts at the local and regional levels.

1.3 A Description of CODES

CODES consists of linked statewide crash and injury data that match vehicle, crash, and human behavior characteristics to their specific medical and financial outcomes. These state data are located in multiple sources: crash data collected by police at the scene; EMS data collected by EMTs who provide treatment at the scene and enroute; medical data collected by physicians, nurses and others who provide treatment at the emergency department, in the hospital, or outpatient setting; and third party payors who pay. Linkage enables persons involved in the motor vehicle crash to be traced from the scene to their final medical and financial outcomes. To implement CODES, states, as a minimum, need computerized statewide crash, hospital, and EMS or emergency department data that have sufficient information to discriminate among the crash events and persons involved in each event. When these data are also linked to driver licensing, vehicle registration, citation/conviction records, insurance claims, HMO/managed care/etc.

outpatient records, etc., the linked data are more comprehensive and thus even more useful for state specific purposes. Although state data are frequently imperfect, linkage is feasible using a probabilistic linkage technology that identifies valid matches without requiring exact matches among the attribute values. This technology makes it possible to process a phenomenal amount of data in a short amount of time. Successful implementation of CODES depends upon an Advisory Committee consisting of the owners and major users of the state data who collaboratively resolve issues related to data access, patient confidentiality, management and release of the linked data and institutionalization of CODES. An added benefit of data linkage is that data quality improves when missing and inaccurate data highlighted during the linkage process are corrected.

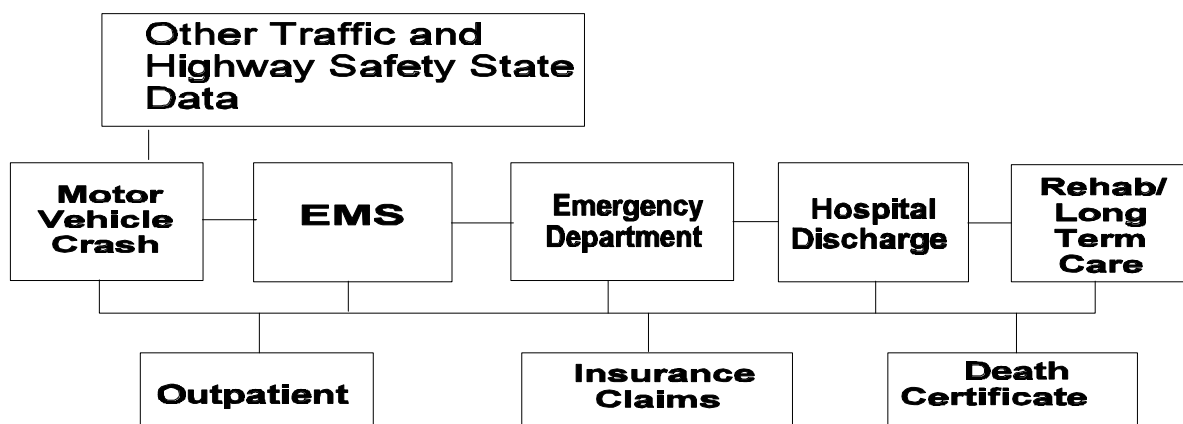


Exhibit 1

1.4 Implementation of CODES

NHTSA funded Hawaii, Maine, Missouri, New York, Pennsylvania, Utah, and Wisconsin to implement Crash Outcome Data Evaluation Systems (CODES) to generate linked state crash and injury data for the required analyses and for state specific purposes. Statewide police reported crash reports were linked to emergency medical services, emergency department, hospital discharge, rehabilitation, long term care, death certificate and/or claims data as shown in Exhibit 1. Each state's linked data base varies in terms of the number of data files linked but all of them include at least 12 months of person-specific, population-based, statewide data that permit tracking of persons involved in motor vehicle crashes from the scene to final disposition. Each state controls access to its linked data. To encourage the development of new applications for linked data, NHTSA funded three of the CODES states (New York, Pennsylvania, Wisconsin) and three other states (Alaska, Connecticut, and New Mexico) to use their existing linked state data to develop additional state-specific applications. To encourage the development of data

linkage capabilities in all states nationally, NHTSA funded Connecticut, Maryland, Nevada, New Hampshire, North Dakota, Oklahoma, South Dakota in 1997 and Iowa, Kentucky, Massachusetts, Nebraska and South Carolina in 1998. NHTSA also will fund additional states in 1999.

2.0 BACKGROUND

2.1. Data Resources and Case Selection

For computerized data files to be linked, they must exist. Unfortunately, not all states have crash and injury data that are statewide and computerized. Almost all of the states have computerized crash data statewide. Half of the states have developed state EMS data systems, but only a few have state emergency department data systems. A majority of the states have computerized state hospital discharge data systems. All of the states have computerized Medicaid and Medicare data systems, but few states have statewide computerized data files for private vehicle or health insurance claims data. Access to data for the less seriously injured victims, a group that includes many of the successes for highway safety, is difficult to obtain because the data may not be computerized. Or if computerized, they are computerized by provider or by insurance group and rarely statewide. Injury data are particularly useful to highway safety because they document what happens to all victims injured in motor vehicle crashes, regardless of whether the crash itself meets police reporting thresholds.

More information about the experience of the seven original CODES states performing the data linkage may be obtained from the *Technical Report: Crash Outcome Data Evaluation System Project* published by NHTSA. Table 1 below presents the study populations that can be generated from the linkage of different groups of state data files.

| Table 1: Populations Generated by Groups of Linked Data | | | | |
|--|---------------------|---------------------------|--|---|
| Crash Data Linked to: | Hospitalized | Transported by EMS | Treated in ED Regardless of EMS Transport | Treated as Outpatients at Physician's Office |
| Hospital | X | | | |
| EMS, Hospital | X | X | | |
| EMS, ED, Hosp. | X | X | X | |
| Medicare /Medicaid Insurance | X | X | X | X |

2.2 Issues Related to “As Reported” Data and the Linkage Process

The usefulness of existing computerized state data collected for other purposes and then linked to fulfill highway safety data needs depends upon the quality of “as reported” state data. The user must understand what and how the state data are collected since data quality reflects the environment of the crash and the existence of legislative mandates. The following issues must be considered when developing applications for linked crash and injury state data.

2.2.1 Utilization of Safety Measures: Crash data document the events of a crash including utilization information to support police enforcement activities related to safety devices. Over or under reporting of utilization may be related to the existence and enforcement of laws and insurance regulations mandating their use, or non-use in the case of alcohol. For example, when a state penalizes occupants who fail to buckle up, the unbelted occupant involved in a crash may be tempted to report belt use, particularly when the crash or injury is minor. Thus, “as reported” data alone may inflate the calculations of effectiveness. Combining “as reported” with observed or linked data is likely to generate more realistic rates.

2.2.2 Defining an Injury: Injury data include medical information about the occurrence of injuries and their costs. Without linkage to the crash data, victims injured in a motor vehicle crash can be identified in the injury data only when the medical record documents the external cause of injury (motor vehicle crash, fall, etc.), for example by an E-code. Use of the E-code is useful to identify records for injuries caused by a motor vehicle crash that failed to link to a crash report or were not reportable because the crash occurred on a non-public road. Thus, use of both crash and injury data together is more likely to identify more of injuries resulting from motor vehicle crashes than use of the crash or injury data alone.

2.2.3 Identifying the Type of Injury: Documentation of the type of injury varies in the different state data files. Non-medical data sources, such as the crash report, may document the area and type of injury in general terms such as head, neck, bleeding and broken bone. Injury severity in this type of data is documented in functional terms to indicate the need for help from the scene (killed, incapacitated, non-incapacitated, possible, none). Medical data sources use more specific terms. EMS data indicate specific types and areas of injury augmented by information describing the treatment provided and record injury severity using the patient’s vital signs. Hospital data document the area and type of injury using medical terms coded according to the International Classification of Diseases, 9th edition, Clinical Modifications (ICD-9-CM). Injury severity is then defined in anatomical terms based on the ICD-9-CM codes. Thus, a group of head injured patients selected from the crash data is likely to include non-head injuries compared to a group of head injured patients selected from the more precise hospital data.

2.2.4 Identifying Costs and Charges: Injury data document the total charges associated with providing medical care to a specific patient but do not document the actual cost of providing care or the actual revenue received by the provider of the care. Charge information is recorded for patients discharged from an acute care hospital. Sometimes this information is also available from billing records for patients transported by EMS or treated in the emergency department. It is important to note that total charges represent the “price” charged for treatment. Charge information documented in EMS, emergency department, and hospital data systems may not include charges by private physicians who are not on the staff of the facility/agency where the patient is treated. Charge information also does not include the indirect costs, such as loss of productivity or long term care and social support, incurred by those suffering long term disability. The bottom line is that total charges are commonly used to report “costs” of health care. However, the user must remember that the charge information that is available understate the total expenses incurred as the result of motor vehicle crashes.

2.2.5 The Linkage Process: Some measures, such as effectiveness rates, for countermeasures are not affected by the linkage process unless the false negative rate (records for injured victims that should have linked but did not) is high enough to misrepresent the injured population. However, the failure to link may cause totals, such as total EMS transports, hospitalizations, charges, and hospital days, to be understated. In addition, average charges may be understated if the unlinked records contain injured persons with unusually high hospital charges and long lengths of stay.

Records with more discriminating information about the events and persons involved are more likely to match than records with less information. For example, date of birth is frequently available on the crash report only for drivers. Without the capability to obtain date of birth for non-drivers through ancillary linkages, injury records for drivers are more likely to link than those for non-drivers. The potential for systematic biases to occur can be estimated by reviewing variations in submission and data quality rates by police agency, provider, or geographic service area to ensure that specific population groups, types of services, etc. are not under- or over-reported for either the injured or uninjured.

Thus, before performing any analyses, the accuracy and completeness of the linked data must be evaluated relative to the type of study population and the outcome measures used for the study.

2.3 Organization of the Catalog

This catalog presents some of the types of state specific applications developed or in process to date by the CODES states. The applications published in this version reflect how the linked state data are being used to support state-specific efforts. The types of applications are listed under one of six subject areas: Injury Prevention, Traffic Safety, Highway Safety, EMS, Data Quality, and General Applications. Within each subject area, the applications are categorized by topic area. Exhibit 2 presents the topic areas included within each subject area. Within each topic area, the

applications are sorted by type (study, fact sheet, management report) and listed alphabetically by state.

| Exhibit 2: Classification of State Specific APPLICATIONS for Linked Data by Subject Area and Topic | |
|--|--|
| Subject Area | Topic Areas |
| 3.0 Injury Prevention | 3.1 Occurrence of Injury 3.2 Health Care Costs |
| 4.0 Traffic Safety | 4.1 Crash Characteristics 4.2 Vehicle Characteristics 4.3 Person Characteristics |
| 5.0 Highway Safety | 5.1 Roadway |
| 6.0 EMS | 6.1 EMS Transports |
| 7.0 Data Quality | 7.1 Under/overreporting of Occurrences 7.2 Errors in Financial Information 7.3 Developing State Data 7.4 Validating the Linkage |
| 8.0 General Applications | |

Information describing each state specific application is presented using the following format:

(Title and Authors)

| | |
|----------------|--|
| Scope | (time period and definition of study population) |
| Data Used | (names of state data files linked for the application) |
| Format | (indication that application is a study, fact sheet, management report, report) |
| Description | (summary of the methodology and types of information used to generate the application) |
| Contact Person | (person to contact for more information about the application) |

Copies of the studies, fact sheets, management reports or reports presented in this catalog may be obtained directly from the contact person listed for each application.

3.0 APPLICATIONS FOR INJURY PREVENTION

3.1 Evaluating the Occurrence of Injury

3.1.1 By Age and Sex

Studies

The Usefulness of Linked Data in Exploring Issues Associated with Motor Vehicle Crashes Involving Drivers Ages 16 Through 20 Years in Alaska .

Martha Moore

| | |
|----------------|--|
| Scope | Persons aged 16 through 50 involved in 1991-1995 crashes statewide in Alaska |
| Data Used | Crash linked to trauma registry data that include all injuries statewide admitted to a hospital, transferred to another acute care facility, or declared dead in the ED. |
| Format | Study |
| Description | This study uses the linked data to examine the role of youth and inexperience (drivers age 16 through 20) in motor vehicle crashes, the contributing factors of crashes involving drivers from this age group, the medical outcomes of crashes involving youth and the costs associated with these crashes (including the payers of these costs). The goal of the project is to use linked data to enact a graduated licensing law in Alaska in order to reduce death, disability, and costs for drivers aged 16-20. |
| Contact Person | Martha Moore TEL: 907-465-8631; FAX: 907-465-4101 email: mmoore@health.state.ak.us |

3.1.1 Age and Sex

An Evaluation of Motor Vehicle Crashes Involving Elderly Drivers in Connecticut
Lorna Thibeault, Gerald Zuckier and Lenworth Jacobs

| | |
|----------------|--|
| Scope | All persons involved in 1995 crashes statewide in Connecticut |
| Data Used | Crash data linked to a linked data file including emergency department, ambulatory surgery, hospital inpatient discharge, death certificate data. |
| Format | Study |
| Description | Multiple logistic regression with backward stepwise selection was used to identify crash characteristics associated with elderly drivers. Outcome variables included frequency of elderly drivers in motor vehicle crashes, injury status, length of stay, total hospital charge, mortality, severity of injury. Independent variables included age, gender, location of the crash, fixed object struck, speeding, following too closely, violating traffic controls, unsafe use of highway by pedestrian, driver illness, construction, road surface, snow, rain, drinking status of driver, lighting conditions, type of motor vehicle, collision type, and injury classification. Connecticut linked these data using a deterministic algorithm prior to CODES funding. |
| Contact Person | Gerald Zuckier TEL: 203-294-7354; FAX: 203-284-9318 email: zuckier@chime.org |

Factors Associated with Age and Sex Differences in Crash Outcomes in Maine (in process)

| | |
|----------------|--|
| Scope | All persons involved in 1995-1996 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital discharge and death certificate data |
| Format | Study |
| Description | A multivariate analysis was conducted in which the independent variables included license status (e.g. active, suspended, permit, none) age/sex, number of persons in the vehicle, time of day, restraint use, physical condition of the driver (e.g. OUI), contributing factors (e.g. illegal unsafe speed, driver inexperience), pre-crash actions (e.g. passing, turning), and single vs multi-vehicle crashes. Outcomes included EMS transport, hospitalization, or death. Factors associated with the greatest amount of total cost (hospital charges) were identified. The study was expanded to consider other issues related to bicycle, pedestrian, and motorcycle crashes. |
| Contact Person | Cathy St. Pierre TEL: 207-624-5467; FAX: 207-624-5470 email: cathy.s.stpierre@state.me.us |

3.1.1 Age and Sex

Analysis of 1996 Maine Crashes Involving Young Adults
Maine CODES Board of Directors

| | |
|----------------|---|
| Scope | All occupants of passenger cars and light trucks involved in motor vehicle crashes statewide in Maine in 1996. |
| Data Used | Crash linked to EMS, hospital discharge and death certificate data; driver license data. |
| Format | Study |
| Description | Young drivers were defined as ages 16-24 and compared to drivers ages 25-69. Older drivers were excluded. Bivariate tables and multivariate logistic analyses were utilized. The independent variables included license status (suspended), alcohol related, illegal/unsafe speed, driver inexperience, overtaking/passing, seat belt use and driver's sex. Crash factors included time of day (8PM to 4AM), location (rural vs urban), posted speed limit, intersection crash, turning movement, and multi-vehicle crash. Outcomes included any injury, EMS transport, hospitalization, head injury, death and hospital charges. |
| Contact Person | Cathy St. Pierre TEL: 207-624-5467; FAX: 207-624-5470 email: cathy.s.stpierre@state.me.us |

Hospitalized Driver's Injuries by Age Group: a Focus on Older Drivers in New York
Joanne Guardino

| | |
|----------------|---|
| Scope | All persons involved in 1992 motor vehicle crashes statewide in New York |
| Data Used | Crash linked to EMS and hospital discharge data |
| Format | Study |
| Description | This study evaluates the increased risk for injury from a motor vehicle crash by age group, particularly the elderly population. All drivers were assigned to groups covering a span of 10 years (16-24, 25-34, etc.). Factors, such as speed, contributing to the crash, use of protective devices were considered. Type of injury, length of stay, and hospital charges were compared for each age group. |
| Contact Person | Anne Dowling TEL: 518-453-0291; FAX: 518-453-0298 adowling@global2000.net |

3.1.1 Age and Sex

Crashes Involving Older Drivers in New York

Ann Dowling

| | |
|----------------|---|
| Scope | All persons involved in 1994 motor vehicle crashes statewide in New York |
| Data Used | Crash linked to EMS and hospital discharge data |
| Format | Study |
| Description | This study provides information about the impact of driver age on the type/severity of injuries and medical costs after consideration of safety equipment and vehicle type. Severity is measured using ICD-9-CM, AIS, and ISS scores. |
| Contact Person | Anne Dowling TEL: 518-453-0291; FAX: 518-453-0298 adowling@global2000.net |

Fact Sheets

Youth Traffic Safety: Fact Sheet

Martha Moore

| | |
|----------------|--|
| Scope | Persons aged 16-20 involved in 1991-1995 crashes statewide in Alaska |
| Data Used | Crash linked to Trauma Registry (includes all injuries statewide that are admitted to a hospital, transferred to another acute care facility, or declared dead in the ED). |
| Format | Fact Sheet |
| Description | This youth traffic safety fact sheet compares 1995 national data for ages 15-20 with 1991-1995 Alaskan data for ages 16-20. The format includes results generated from linked crash and injury data. |
| Contact Person | Martha Moore TEL: 907-465-8631; FAX: 907-465-4101 email: mmoore@health.state.ak.us |

3.1.1 Age and Sex

Management Reports

Injury Rates and Outcome for Males by Age in 1995 Crashes in Maine

Maine CODES Board of Directors

| | |
|----------------|---|
| Scope | All males involved in 1995 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital and census data |
| Format | Management Report |
| Description | This management report presents total male population, total male persons involved, total males injured, and the injury rate per 100,000 males. For those males injured, it presents the total transported by EMS, hospitalized, hospital days, hospital charges, head injury, fatals, and years of potential life lost. Data are reported by age groups. |
| Contact Person | Cathy St. Pierre TEL: 207-624-5467; FAX: 207-624-5470 email: cathy.s.stpierre@state.me.us |

Injury Rates and Outcome for Females by Age in 1995 Crashes in Maine

Maine CODES Board of Directors

| | |
|----------------|---|
| Scope | All females involved in 1995 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital and census data |
| Format | Management Report |
| Description | This management report presents total female population, total female persons involved, total females injured, and the injury rate per 100,000 females. For those females injured, it presents the total transported by EMS, hospitalized, hospital days, hospital charges, head injury, fatals, and years of potential life lost. Data are reported by age groups. |
| Contact Person | Cathy St. Pierre TEL: 207-624-5467; FAX: 207-624-5470 email: cathy.s.stpierre@state.me.us |

3.1.1 Age and Sex

3.1.2 Involving Pedestrians

Fact Sheets

1996 Crash Fact Sheet: Pedestrian Facts in Utah

Amy Lightfoot, Stacey Knight, Larry Cook, Pat Nechodom

| | |
|----------------|---|
| Scope | All persons involved in 1996 motor vehicle crashes statewide in Utah |
| Data Used | Crash linked to hospital inpatient data |
| Format | Fact Sheet |
| Description | This one page fact sheet compares pedestrians to other crash participants. Information is provided showing variations in risk, hospital days and charges. Pedestrians involved in motor vehicle crashes are defined by age, time of day, day and month. |
| Contact Person | Pat Nechodom TEL: 801-581-6410; FAX: 801-581-8686 email: pat.nechodom@hsc.utah.edu |

Management Reports

Injury Outcome by Age Group for Male Pedestrians in 1996 Crashes in Maine

Maine CODES Board of Directors

| | |
|----------------|---|
| Scope | All persons involved in 1996 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital and census data |
| Format | Management Report |
| Description | This management report presents injury outcome for male pedestrians including total male population, total male pedestrians involved, total injured and injury rate per 100,000, total transported by EMS, total admitted to a hospital, total hospital days and charges, total with head injury, total deaths and total years of potential life lost. Data are reported by age groups. |
| Contact Person | Cathy St. Pierre TEL: 207-624-5467; FAX: 207-624-5470 email: cathy.s.stpierre@state.me.us |

3.1.1 Age and Sex/3.1.2 Pedestrians

Injury Outcome by Age Group for Female Pedestrians in 1996 Crashes in Maine
Maine CODES Board of Directors

| | |
|----------------|---|
| Scope | All persons involved in 1996 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital and census data |
| Format | Management Report |
| Description | This management report presents injury outcome for female pedestrians including total female population, total female pedestrians involved, total injured and injury rate per 100,000, total transported by EMS, total admitted to a hospital, total hospital days and charges, total with head injury, total deaths and total years of potential life lost. Data are reported by age groups. |
| Contact Person | Cathy St. Pierre TEL: 207-624-5467; FAX: 207-624-5470 email: cathy.s.stpierre@state.me.us |

Injury Outcome by County of Crash Location for Pedestrians Involved in 1996 Crashes in Maine
Maine CODES Board of Directors

| | |
|----------------|--|
| Scope | All persons involved in 1996 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital and census data |
| Format | Management Report |
| Description | This management report presents injury outcome by county of crash including total population, total pedestrians involved, total injured and injury rate per 100,000, total transported by EMS, total admitted to a hospital, total hospital days and charges, total with head injury, total deaths and total years of potential life lost. Data are reported for each of the 16 counties in Maine. |
| Contact Person | Cathy St. Pierre TEL: 207-624-5467; FAX: 207-624-5470 email: cathy.s.stpierre@state.me.us |

3.1.2 Pedestrians

Injury Outcome by Month of Crash for Pedestrians in Crashes in Maine
Karl Finison and Gary Menchen

| | |
|----------------|--|
| Scope | All persons involved in 1991 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital and census data |
| Format | Management Report |
| Description | This management report presents the injury outcome by month of the crash for pedestrians involved in crashes including the total involved, total injured, injury rate per 100,000, total transported by EMS, total admitted to a hospital, total with severe injury ISS>15, total charges, total with head/spinal injuries, total deaths and total years of potential life lost. |
| Contact Person | Karl Finison TEL: 207-623-2555; FAX: 207-622-7086 email: kfinison@mhic.org |

Injury Outcome by Day of Week of Crash for Pedestrians in Crashes in Maine
Karl Finison and Gary Menchen

| | |
|----------------|--|
| Scope | All persons involved in 1991 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital and census data |
| Format | Management Report |
| Description | This management report presents the injury outcome by day of week of the crash for pedestrians involved in crashes including the total involved, total injured, injury rate per 100,000, total transported by EMS, total admitted to a hospital, total with severe injury ISS>15, total charges, total with head/spinal injuries, total deaths and total years of potential life lost. |
| Contact Person | Karl Finison TEL: 207-623-2555; FAX: 207-622-7086 email: kfinison@mhic.org |

3.1.2 Pedestrians

Injury Outcome by Time of Crash (1 hour intervals) for Pedestrians in Crashes in Maine
Karl Finison and Gary Menchen.

| | |
|----------------|--|
| Scope | All persons involved in 1991 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital and census data |
| Format | Management Report |
| Description | This management report presents by time of the crash, using one hour intervals, for pedestrians involved in crashes the injury outcome including the total involved, total injured, injury rate per 100,000, total transported by EMS, total admitted to a hospital, total with severe injury ISS>15, total charges, total with head/spinal injuries, total deaths and total years of potential life lost. |
| Contact Person | Karl Finison TEL: 207-623-2555; FAX: 207-622-7086 email: kfinison@mhic.org |

Injury Outcome for Pedestrians Involved in Alcohol-Related Crashes in Maine
Karl Finison and Gary Menchen.

| | |
|----------------|---|
| Scope | All persons involved in 1991 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital and census data |
| Format | Management Report |
| Description | This management report presents injury outcome for pedestrians involved in alcohol and non alcohol-related crashes including the total involved, total injured, total transported by EMS, total admitted to a hospital, total with severe injury ISS>15, total charges, total with head/spinal injuries, total deaths, total years of potential life lost, and relative risk. |
| Contact Person | Karl Finison TEL: 207-623-2555; FAX: 207-622-7086 email: kfinison@mhic.org |

3.1.2 Pedestrians

Injury Outcome for Pedestrians Involved in Motor Vehicle Crashes by Population Density of Crash Location in Maine

Karl Finison and Gary Menchen.

| | |
|----------------|--|
| Scope | All persons involved in 1991 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital and census data |
| Format | Management Report |
| Description | This management report presents for pedestrians involved in motor vehicle crashes by population density of crash location, the injury outcome including the total involved, total injured, total transported by EMS, total admitted to a hospital, total with severe injury ISS>15, total charges, total with head/spinal injuries, total deaths, total years of potential life lost, and relative risk of injury. Crash location is defined as population per square mile as follows: metro (>500), urban (101-500), Suburban (51-100), rural (7-50), wilderness (<7), unknown. |
| Contact Person | Karl Finison TEL: 207-623-2555; FAX: 207-622-7086 email: kfinison@mhic.org |

Injury Outcome for Pedestrians Involved in Crashes by Roadway Location of Crash in Maine

Karl Finison and Gary Menchen

| | |
|----------------|---|
| Scope | All persons involved in 1991 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital and census data |
| Format | Management Report |
| Description | This management report presents for pedestrians involved in crashes by roadway location of crash the total involved, total injured, percent of total injured, total transported by EMS, total admitted to a hospital, total with severe injury ISS>15, total charges, total with head/spinal injuries, total deaths, years of potential life lost and the relative risk. Location of crash is defined as straight road, curved, 3 legged intersection, 4 legged intersection, 5 legged intersection, driveways, bridges, interchange, other, missing/invalid. |
| Contact Person | Karl Finison TEL: 207-623-2555; FAX: 207-622-7086 email: kfinison@mhic.org |

3.1.2 Pedestrians

Injury Outcome for Pedestrians Involved in Motor Vehicle Crashes by Apparent Contributing Factor in Maine

Karl Finison and Gary Menchen

| | |
|----------------|--|
| Scope | All persons involved in 1991 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital and census data |
| Format | Management Report |
| Description | This management report presents for pedestrians involved in motor vehicle crashes by apparent contributing factor in single vehicle crashes, the total involved, total injured, percent of total injured, total transported by EMS, total admitted to a hospital, total with severe injury ISS>15, total charges, total with head/spinal injuries, total deaths and years of potential life lost. Results are shown separately for thirty different apparent contributing factors. |
| Contact Person | Karl Finison TEL: 207-623-2555; FAX: 207-622-7086 email: kfinison@mhic.org |

3.1.3 Involving Bicyclists

Management Reports

Injury Outcome by Age Group for Male Bicyclists Involved in 1996 Crashes in Maine

Maine CODES Board of Directors

| | |
|----------------|---|
| Scope | All persons involved in 1996 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital and census data |
| Format | Management Report |
| Description | This management report presents injury outcome for male bicyclists including total male population, total male bicyclists involved, total injured and injury rate per 100,000, total transported by EMS, total admitted to a hospital, total hospital days and charges, total with head injury, total deaths and total years of potential life lost. Data are reported by age groups. |
| Contact Person | Cathy St. Pierre TEL: 207-624-5467; FAX: 207-624-5470 email: cathy.s.stpierre@state.me.us |

3.1.2 Pedestrians/3.1.3 Bicyclists

Injury Outcome by Age Group for Female Bicyclists Involved in 1996 Crashes in Maine
Maine CODES Board of Directors

| | |
|----------------|---|
| Scope | All persons involved in 1996 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital and census data |
| Format | Management Report |
| Description | This management report presents injury outcome for female bicyclists including total female population, total female bicyclists involved, total injured and injury rate per 100,000, total transported by EMS, total admitted to a hospital, total hospital days and charges, total with head injury, total deaths and total years of potential life lost. Data are reported by age groups. |
| Contact Person | Cathy St. Pierre TEL: 207-624-5467; FAX: 207-624-5470 email: cathy.s.stpierre@state.me.us |

Injury Outcome by County of Crash Location for Bicyclists Involved in 1996 Crashes in Maine
Maine CODES Board of Directors

| | |
|----------------|---|
| Scope | All persons involved in 1996 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital and census data |
| Format | Management Report |
| Description | This management report presents injury outcome by county of crash including total population, total bicyclists involved, total injured and injury rate per 100,000, total transported by EMS, total admitted to a hospital, total hospital days and charges, total with head injury, total deaths and total years of potential life lost. Data are reported for each of the 16 counties in Maine. |
| Contact Person | Cathy St. Pierre TEL: 207-624-5467; FAX: 207-624-5470 email: cathy.s.stpierre@state.me.us |

3.1.3 Bicyclists

Injury Outcome by Month of Crash for Bicyclists Involved in Crashes in Maine
Karl Finison and Gary Menchen.

| | |
|----------------|---|
| Scope | All persons involved in 1991 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital and census data |
| Format | Management Report |
| Description | This management report presents for bicyclists involved in crashes the injury outcome by month of crash for pedestrians including the total involved, total injured, injury rate per 100,000, total transported by EMS, total admitted to a hospital, total with severe injury ISS>15, total charges, total with head/spinal injuries, total deaths and total years of potential life lost. |
| Contact Person | Karl Finison TEL: 207-623-2555; FAX: 207-622-7086 email: kfinison@mhic.org |

Injury Outcome by Day of Week of Crash for Bicyclists Involved in Crashes in Maine
Karl Finison and Gary Menchen.

| | |
|----------------|--|
| Scope | All persons involved in 1991 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital and census data |
| Format | Management Report |
| Description | This management report presents by day of week for bicyclists involved in crashes the injury outcome including the total involved, total injured, injury rate per 100,000, total transported by EMS, total admitted to a hospital, total with severe injury ISS>15, total charges, total with head/spinal injuries, total deaths and total years of potential life lost. |
| Contact Person | Karl Finison TEL: 207-623-2555; FAX: 207-622-7086 email: kfinison@mhic.org |

3.1.3 Bicyclists

Injury Outcome by Time of Crash (1 hour intervals) for Bicyclists Involved in Crashes in Maine
Karl Finison and Gary Menchen.

| | |
|----------------|---|
| Scope | All persons involved in 1991 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital and census data |
| Format | Management Report |
| Description | This management report presents for bicyclists involved in crashes by time of crash using one hour intervals the injury outcome including the total involved, total injured, injury rate per 100,000, total transported by EMS, total admitted to a hospital, total with severe injury ISS>15, total charges, total with head/spinal injuries, total deaths and total years of potential life lost. |
| Contact Person | Karl Finison TEL: 207-623-2555; FAX: 207-622-7086 email: kfinison@mhic.org |

Injury Outcome for Bicyclists Involved in Alcohol-Related Crashes in Maine
Karl Finison and Gary Menchen.

| | |
|----------------|--|
| Scope | All persons involved in 1991 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital and census data |
| Format | Management Report |
| Description | This management report presents injury outcome for bicyclists including the total involved, total injured, total transported by EMS, total admitted to a hospital, total with severe injury ISS>15, total charges, total with head/spinal injuries, total deaths, total years of potential life lost, and relative risk. Data are reported separately for alcohol involved and non-alcohol involved crashes. |
| Contact Person | Karl Finison TEL: 207-623-2555; FAX: 207-622-7086 email: kfinison@mhic.org |

3.1.3 Bicyclists

Injury Outcome for Bicyclists Involved in Motor Vehicle Crashes by Population Density of Crash Location in Maine

Karl Finison and Gary Menchen.

| | |
|----------------|---|
| Scope | All persons involved in 1991 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital and census data |
| Format | Management Report |
| Description | This management report presents for bicyclists involved in motor vehicle crashes by population density of crash location, the injury outcome including the total involved, total injured, total transported by EMS, total admitted to a hospital, total with severe injury ISS>15, total charges, total with head/spinal injuries, total deaths, total years of potential life lost, and relative risk of injury. Crash location is defined as population per square mile as follows: metro (>500), urban (101-500), Suburban (51-100), rural (7-50), wilderness (<7), unknown. |
| Contact Person | Karl Finison TEL: 207-623-2555; FAX: 207-622-7086 email: kfinison@mhic.org |

Injury Outcome for Bicyclists Involved in Crashes by Roadway Location of Crash in Maine

Karl Finison and Gary Menchen

| | |
|----------------|---|
| Scope | All persons involved in 1991 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital and census data |
| Format | Management Report |
| Description | This management report presents for bicyclists involved in crashes by roadway location of crash the total involved, total injured, percent of total injured, total transported by EMS, total admitted to a hospital, total with severe injury ISS>15, total charges, total with head/spinal injuries, total deaths, years of potential life lost and the relative risk. Roadway location is defined as straight road, curved, 3 legged intersection, 4 legged intersection, 5 legged intersection, driveways, bridges, interchange, other, missing/invalid. |
| Contact Person | Karl Finison TEL: 207-623-2555; FAX: 207-622-7086 email: kfinison@mhic.org |

3.1.3 Bicyclists

Injury Outcome for Bicyclists Involved in Motor Vehicle Crashes by Apparent Contributing Factor in Maine

Karl Finison and Gary Menchen

| | |
|----------------|--|
| Scope | All persons involved in 1991 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital and census data |
| Format | Management Report |
| Description | This management report presents for bicyclists involved in motor vehicle crashes by apparent contributing factor the total involved, total injured, percent of total injured, total transported by EMS, total admitted to a hospital, total with severe injury ISS>15, total charges, total with head/spinal injuries, total deaths and years of potential life lost. Results are shown separately for thirty different apparent contributing factors. |
| Contact Person | Karl Finison TEL: 207-623-2555; FAX: 207-622-7086 email: kfinison@mhic.org |

3.1.4 Involving Motorcyclists

Injury Outcome by Age Group for Motorcyclists Involved in 1996 Crashes in Maine

Maine CODES Board of Directors

| | |
|----------------|--|
| Scope | All persons involved in 1996 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital and census data |
| Format | Management Report |
| Description | This management report presents injury outcome by age group for motorcyclists including total registered motorcyclists, total motorcycle crashes, crash rate per 100,000 drivers, total persons involved, total injured and injury rate per 100,000 drivers, total transported by EMS, total admitted to a hospital, total hospital days and charges, total with head injury, total deaths and total years of potential life lost. |
| Contact Person | Cathy St. Pierre TEL: 207-624-5467; FAX: 207-624-5470 email: cathy.s.stpierre@state.me.us |

3.1.3 Bicyclists/3.1.4 Motorcyclists

3.1.5 By Geographic Location

Studies

Analysis of Medical and Financial Outcomes of Motor Vehicle Crash/Injuries in Connecticut.

Lorna Thibeault, Gerald Zuckier and Lenworth Jacobs

| | |
|----------------|--|
| Scope | All persons involved in 1995 crashes in Connecticut |
| Data Used | Crash data linked to emergency department, ambulatory surgery, hospital inpatient discharge, death certificate data. |
| Format | Study |
| Description | Multiple logistic regression with backward stepwise selection and outcome defined as the frequency of severe injury (killed or incapacitating), severity of injury, mortality, length of stay, discharge disposition, and total hospital charges were used. Age was categorized into 5 sub-groups and length of stay into three groups. Mortality was categorized in terms of place of death (scene, ED, hospital, after discharge). Type of injury was defined according to KABCO. Independent variables included age, gender, location of the crash, location of fixed object struck, speeding, following too closely, violating traffic controls, unsafe use of highway by pedestrian, driver illness, construction, road surface, snow , rain, drinking status of driver and lighting conditions, type of motor vehicle, collision type, and injury classification. Data linked using deterministic algorithm. |
| Contact Person | Gerald Zuckier TEL: 203-294-7354; FAX: 203-284-9318 email: zuckier@chime.org |

3.1.5 Geo Location

Management Reports

Injury Outcome by County of Crash Location in Maine

Maine CODES Board of Directors

| | |
|----------------|--|
| Scope | All persons involved in 1995 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital and census data |
| Format | Management Report |
| Description | This management report presents by county in Maine, the population, the total number of crashes, total vehicles involved, total persons involved, total injured, injury rate per 100,000, total transported by EMS, total hospitalized, total hospital days, total hospital charges, total with head injury, total fatalities, and years of potential life lost. Data are reported for the 16 counties in Maine. |
| Contact Person | Cathy St. Pierre TEL: 207-624-5467; FAX: 207-624-5470 email: cathy.s.stpierre@state.me.us |

Injury Outcome by Hospital Service Area in Maine

Karl Finison and Gary Menchen

| | |
|----------------|---|
| Scope | All persons involved in 1991 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital and census data |
| Format | Management Report |
| Description | This management report presents by hospital service area in Maine, the total occupants, total injured, injury rate per 100,000 population, total transported by EMS, total admitted to a hospital, total with severe injury ISS>15, total charges, total with head/spinal injuries, total deaths, and the years of potential life lost. Data are reported for 32 hospital service areas within Maine. |
| Contact Person | Karl Finison TEL: 207-623-2555; FAX: 207-622-7086 email: kfinison@mhic.org |

3.1.5 Geo Location

Injury Outcome by Population Density of Crash Location in Maine

Karl Finison and Gary Menchen

| | |
|----------------|---|
| Scope | All persons involved in 1991 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital and census data |
| Format | Management Report |
| Description | This management report presents by population density of the crash location in Maine, the total occupants, total injured, percent of total injuries, total transported by EMS, total admitted to a hospital, total with severe injury ISS>15, total charges, total with head/spinal injuries, total deaths, and the years of potential life lost and the relative risk. Crash location is defined as population per square mile as follows: metro (>500), urban (101-500), Suburban (51-100), rural (7-50), wilderness (<7), unknown. |
| Contact Person | Karl Finison TEL: 207-623-2555; FAX: 207-622-7086 email: kfinison@mhic.org |

3.1.6 By Date and Time

Management Reports

Injury Outcome by Month of Crash in Maine

Karl Finison and Gary Menchen

| | |
|----------------|--|
| Scope | All persons involved in 1991 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital and census data |
| Format | Management Report |
| Description | This management report presents by month for persons injured in motor vehicle crashes the total occupants, total injured, total transported by EMS, total admitted to a hospital, total with severe injury ISS>15, total charges, total with head/spinal injuries, total deaths, and the years of potential life lost. |
| Contact Person | Karl Finison TEL: 207-623-2555; FAX: 207-622-7086 email: kfinison@mhic.org |

3.1.5 Geo Location/3.1.6 Date and Time

Injury Outcome by Day of Week of Crash in Maine
Maine CODES Board of Directors

| | |
|----------------|---|
| Scope | All persons involved in 1995 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital and census data |
| Format | Management Report |
| Description | This management report presents by day of week in Maine, the total number of crashes and vehicles involved, total persons involved, total and percent injured, the observed expected ratio, total transported by EMS, total hospitalized, total hospital days and charges, total head injuries, total deaths, and the years of potential life lost. |
| Contact Person | Cathy St. Pierre TEL: 207-624-5467; FAX: 207-624-5470 email: cathy.s.stpierre@state.me.us |

Injury Outcome by Time of Crash of Crash in Maine
Karl Finison and Gary Menchen

| | |
|----------------|--|
| Scope | All persons involved in 1991 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital and census data |
| Format | Management Report |
| Description | This management report presents by time of crash in Maine using one hour intervals, the total occupants, total injured, percent of total injures, total transported by EMS, total admitted to a hospital, total with severe injury ISS>15, total charges, total with head/spinal injuries, total deaths, and the years of potential life lost. |
| Contact Person | Karl Finison TEL: 207-623-2555; FAX: 207-622-7086 email: kfinison@mhic.org |

3.1.6 Date and Time

3.1.7 By Type of Injury

Studies

Use of CODES Linked Data to Evaluate Traumatic Brain Injury in New Mexico

Stuart Castle and Brian Woods

| | |
|----------------|--|
| Scope | All persons involved in 1995 crashes statewide in New Mexico |
| Data Used | Crash linked to trauma registry, hospital discharge, Medicaid, and Office of the Medical Investigator. |
| Format | Study |
| Description | This study reports on the incidence and cost of motor vehicle and non-motor vehicle related causes of Traumatic Brain Injury. Linked data are used to identify TBI cases that are unique to each data file and those that appear in more than one data file. The study population is described in terms of age, gender, external cause, types of crash vehicles, use of safety equipment, vehicle characteristics, type of road system, county, hospital length of stay, length of unconsciousness, and total charges by mortality/morbidity. In addition, the study indicates the odds of TBI by type of crash severity (towaway, no belts) or by injury categories (fatal/no belt, incapacitating/no belt/ nonincapacitating/no belt, possible/no belt). |
| Contact Person | Stuart Castle TEL:505-827-2915; FAX: 505-827-0013 email: stuartc@doh.state.nm.us |

3.1.7 Type of Injury

Serious Lower Extremity Injuries in Motor Vehicle Crashes: An Example of Injury Research Using Linked Motor Vehicle Crash and Hospital Discharge Data in Wisconsin
Trudy Karlson, Ph.D. and Wayne Bigelow

| | |
|----------------|--|
| Scope | All persons involved in 1990-1994 motor vehicle crashes statewide in Wisconsin |
| Data Used | Crash data linked to hospital discharge and Medicaid data. |
| Format | Study |
| Description | This study reports incidence variations and cost of serious lower extremity injuries from crashes during 1990-1994. Driver age, gender, occupant seating position, use of restraints (including air bag), crash configuration, estimated speed of crash, vehicle type, weight, and other characteristics are evaluated as potential factors for affecting severity and type of injury. Who pays is identified in addition to the distribution of public and private payer sources. Analyses used restraint as reported or as likely based on independent field observation. Serious lower extremity injury are defined as ICD-9-CM 821.00-829.99, 836.00-838.99, 928.00-928.99, 895.00-897.99. Abrasions, contusions and lacerations, strains and sprains are excluded. Costs include hospital charges, estimates for rehabilitation time and treatment for lower extremity injuries, plus Medicaid histories to determine first year physical therapy and other outpatient costs. |
| Contact Person | Martha Florey TEL: 608-266-3557; FAX: 608-267-0441 email: mflorey@mail.state.wi.us |

3.1.8 Type of Treatment for Injury

Studies

Investigating Auto Injury Treatment in a No-fault State: An Analysis of Linked Crash and Auto Insurer Data in Hawaii

Lawrence H. Nitz and Karl Kim

| | |
|----------------|--|
| Scope | All persons involved in motor vehicle crashes occurring between 1990-1991 in Hawaii. |
| Data Used | Crash data linked to auto insurance claims data. |
| Format | Study |
| Description | This study evaluated the choice of care among crash victims in terms of who goes to a chiropractor and the relationship between occupant, vehicle and crash characteristics and the choice of care. Hawaii is a no-fault insurance state |
| Contact Person | Karl Kim TEL: 808-956-7381; FAX: 808-956-6870 email: karlk@hawaii.edu |

3.1.7 Type of Injury/3.1.8 Treatment

3.2 Health Care Costs

3.2.1 Costs and Safety Belt Use

Studies

Focus...Injuries and Costs Associated with Failure to Use Seat Belts in Missouri

Mark Van Tuinen

| | |
|----------------|--|
| Scope | All drivers involved in 1990 motor vehicle crashes statewide in Missouri |
| Data Used | Crash linked to EMS, emergency department, hospital and insurance claims data |
| Format | Study |
| Description | This report presents Missouri specific results of the effectiveness of safety belts on injuries and costs. |
| Contact Person | Mark Van Tuinen TEL: 573-751-6274; FAX: 573-526-4102 email: vantum@mail.health.state.mo.us |

3.2.2 Who Pays?

Studies

Who Incurs and Pays for Hospital Care for Motor Vehicle Crash Victims in Pennsylvania?

Michael Allen and Harold (Hank) Weiss

| | |
|----------------|--|
| Scope | All persons involved in 1994 motor vehicle crashes statewide in Pennsylvania |
| Data Used | Crash linked to EMS and hospital discharge data |
| Format | Study |
| Description | This study describes hospital charges for motor vehicle crash victims as a function of various victim, crash, and vehicle characteristics such as safety belt use, seat position, payer, age, type of crash, type of vehicle and alcohol involvement. Characteristics of groups of individuals and vehicles which are associated with high and low hospital costs and who pays for these costs are identified. Expected payer source is obtained from the hospital discharge data. |
| Contact Person | Hank Weiss TEL: 412-648-2600; FAX: 412-648-8924 email: hweiss@injurycontrol.com |

3.2 Costs

3.2.3 Medicaid and Costs

Studies

The Cost of Motor Vehicle Crash Injuries to the Wisconsin Medicaid Program

Trudy A. Karlson, Martha D. Sumi, Daniel Wickeham, Charles Quade, and Sara Karon

| | |
|----------------|--|
| Scope | All persons involved in 1991 motor vehicle crashes statewide in Wisconsin. |
| Data Used | Crash linked to Medicaid data |
| Format | Study |
| Description | The study describes an algorithm developed to identify the crash-related health care specifically provided by physician, hospital, long term care, and other services to Medicaid beneficiaries. It identifies the cost of this care for beneficiaries who were occupants, pedestrians, or motorcyclists. Costs were identified for (1) individuals who were Medicaid-eligible prior to the crash, and (2) individuals who became eligible immediately following the crash as a result of severe injuries requiring expensive care. Costs for those who became eligible two or three years after the crash when the payments from their liability settlements finally ran out were not included. Alcohol and safety belt use were considered in relation to the costs. |
| Contact Person | Martha Florey TEL: 608-266-3557; FAX: 608-267-0441 email: mflorey@mail.state.wi.us |

3.2.4 Comparing Hospital Costs

Studies

Computing Hospital Cost Savings Using the Entire Crash Population Rather than Only Hospitalized Cases in Utah

J. Michael Dean

| | |
|----------------|---|
| Scope | All persons involved in 1991 motor vehicle crashes statewide in Utah |
| Data Used | Crash linked to EMS, emergency department and hospital data |
| Format | Study |
| Description | This study describes models to compute hospital costs using the entire crash population. Non-hospitalized occupants were assigned a charge of \$0 when the potential cost savings for belt use by the entire crash population was calculated. |
| Contact Person | Pat Nechodom TEL: 801-581-6410; FAX: 801-581-8686 email: pat.nechodom@hsc.utah.edu |

3.2 Costs

Management Reports

Hospital Charges for 1991 Utah Crashes

Pat Nechodom

| | |
|----------------|---|
| Scope | All persons involved in 1991 motor vehicle crashes statewide in Utah |
| Data Used | Crash linked to EMS, emergency department, and hospital data |
| Format | Management Report |
| Description | This management report presents by injury type reported on the crash report (not injured, possibly injured, bruises/abrasions, broken bones/bleeding, fatal) and by hospitalization type (outpatient, inpatient, rehab) for crash victims restrained, unrestrained, and unknown restraint use the total number of cases, total charges, average charge. Similar data is also presented for the crash population as a whole. |
| Contact Person | Pat Nechodom TEL: 801-581-6410; FAX: 801-581-8686; email: pat.nechodom@hsc.utah.edu |

3.2 Costs

4.0 APPLICATIONS FOR TRAFFIC SAFETY

4.1 Crash Characteristics

Studies

Outcome for Crashes Where Vehicles “Ran Off the Road” in Maine

Maine CODES Board of Directors

| | |
|----------------|---|
| Scope | All persons involved in 1996 motor vehicle crashes in Maine |
| Data Used | Crash linked to EMS, hospital discharge and death certificate data; road characteristic data (federal functional class, pavement width, shoulder width) added to the linked data set. |
| Format | Study |
| Description | Outcome was measured for non-intersection, single vehicle ROR that had a valid federal functional class identified. The independent variables included type of vehicle, time, day and month of crash, environmental factors (wet pavement, snow or ice sanded or not sanded), human factors (illegal or unsafe speed, driver inexperience, alcohol, fatigue or asleep), sex of occupant or driver, age of occupant or driver, and road characteristics (average annual daily traffic, composite rural-urban indicator, federal functional road class, speed limit, right shoulder type, lane pavement width, curved or straight road, utility pole or tree hit, pavement roughness factor, and pavement condition factor). Dummy variables created for ages 15-24 and 61 and over. Dependent variables included any fatality, incapacitating, non-incapacitating, or linked to EMS or hospital discharge. |
| Contact Person | Cathy St. Pierre TEL: 207-624-5467; FAX: 207-624-5470 email: cathy.s.stpierre@state.me.us |

4.1 Crash

Overturn Crashes and Injury in New Mexico

Carrie Rudd

| | |
|----------------|--|
| Scope | All persons in 1995 motor vehicle crashes statewide in New Mexico |
| Data Used | Crash linked to trauma registry, hospital discharge, and Office of the Medical Investigator |
| Format | Study |
| Description | Passenger vehicle overturns caused a disproportionate number of deaths and serious injuries in New Mexico in 1995. Overturn occupants were almost twice as likely to sustain a Spinal Cord Injury and were more at risk for Traumatic Brain Injury. Over 80% of overturn injuries occurred on rural roads and almost 64% of overturn injuries involved a driver who was drinking alcohol or driving too fast. 90% ejected occupants were unbelted. |
| Contact Person | Stuart Castle TEL:505-827-2915; FAX: 505-827-0013 email: stuartc@doh.state.nm.us |

Crash Parameters and Cost of Care in New York (in process)

| | |
|----------------|--|
| Scope | All persons involved in 1992 motor vehicle crashes statewide in New York |
| Data Used | Crash linked to EMS, emergency department, hospital and insurance claims data |
| Format | Study |
| Description | Models were constructed to predict case level cost using the maximum abbreviated injury scale (MAIS) or the Injury Severity Score (ISS) for translation to injury severity, body region, and average cost. Transfers, extraordinary treatment cases, or other outliers also were considered. Average and total charges were calculated for both models to determine the impact of the different methodologies. |
| Contact Person | Anne Dowling TEL: 518-453-0291; FAX: 518-453-0298 adowling@global2000.net |

4.1 Crash

Management Reports

Injury Outcome by Posted Speed Limit in Maine

Karl Finison and Garry Menchen

| | |
|----------------|--|
| Scope | All persons involved in 1991 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital, and census data |
| Format | Management Report |
| Description | This management report presents by posted speed limit in Maine, using 5 mile intervals 25-65, unknown/missing, invalid, the total occupants, total injured, percent of total injures, total transported by EMS, total admitted to a hospital, total with severe injury ISS>15, total charges, total with head/spinal injuries, total deaths, years of potential life lost and the relative risk. |
| Contact Person | Karl Finison TEL: 207-623-2555; FAX: 207-622-7086 email: kfinison@mhic.org |

Injury Outcome by Type of Crash in Maine

Maine CODES Board of Directors

| | |
|----------------|--|
| Scope | All persons involved in 1995 motor vehicle crashes statewide in Maine. |
| Data Used | Crash linked to EMS, hospital and census data |
| Format | Management Report |
| Description | This management report presents by type of crash, the total number of crashes, total vehicles involved, total persons involved, total and percent injured, observed expected ratio, total transported by EMS, total hospitalized, total hospital days, total hospital charges, total with head injury, total fatalities, and years of potential life lost. Crash type is defined to include object in road, rear end/side swipe, head on/sideswipe, intersection movement, pedestrians, train, ran off road, animal, bike, other, jack knife, rollover, fire, submersion, rock thrown, not coded and totals. |
| Contact Person | Cathy St. Pierre TEL: 207-624-5467; FAX: 207-624-5470 email: cathy.s.stpierre@state.me.us |

Injury Outcome by Roadway Location of Crash in Maine

Maine CODES Board of Directors

| | |
|----------------|---|
| Scope | All persons involved in 1995 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital, and census data |
| Format | Management Report |
| Description | This management report presents by type of roadway location, the total number of crashes, total vehicles involved, total persons involved, total and percent injured, observed expected ratio, total transported by EMS, total hospitalized, total hospital days, total hospital charges, total with head injury, total fatalities, and years of potential life lost. Location of crash is defined as straight road, curved, 3 leg intersection, 4 leg intersection, 5 leg intersection, driveways, bridges, interchange, other, not coded. |
| Contact Person | Cathy St. Pierre TEL: 207-624-5467; FAX: 207-624-5470 email: cathy.s.stpierre@state.me.us |

Injury Outcome by Light Conditions for Crashes in Maine

Maine CODES Board of Directors

| | |
|----------------|--|
| Scope | All persons involved in 1995 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital, and census data |
| Format | Management Report |
| Description | This management report presents by light condition of the crash the total crashes, total vehicles involved, total persons involved, total and percent injured, observed expected ratio, total transported by EMS, total hospitalized, total hospital days, total charges, total head injuries, total deaths, years of potential life lost. Light conditions are defined as dawn (morning), daylight, dusk (evening), dark (street lights on), dark (no street lights), dark (street lights off), other, not coded. |
| Contact Person | Cathy St. Pierre TEL: 207-624-5467; FAX: 207-624-5470 email: cathy.s.stpierre@state.me.us |

4.1 Crash

Injury Outcome by Road Surface for Crashes in Maine

Maine CODES Board of Directors

| | |
|----------------|---|
| Scope | All persons involved in 1995 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital, and census data |
| Format | Management Report |
| Description | This management report presents by road surface for crashes the total crashes, total vehicles involved, total persons involved, total and percent injured, observed expected ratio, total transported by EMS, total hospitalized, total hospital days, total charges, total head injuries, total deaths, years of potential life lost. Road surface is defined as dry, wet, snow/slush sanded and not sanded, ice packed snow sanded and not sanded, muddy, debris, oily, other, not coded. |
| Contact Person | Cathy St. Pierre TEL: 207-624-5467; FAX: 207-624-5470 email: cathy.s.stpierre@state.me.us |

Injury Outcome by Type of Road Work at Crash in Maine

Karl Finison and Gary Menchen

| | |
|----------------|--|
| Scope | All persons involved in 1991 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital, and census data |
| Format | Management Report |
| Description | This management report presents by type of road work at crash the total occupants, total injured, percent of total injured, total transported by EMS, total admitted to a hospital, total with severe injury ISS>15, total charges, total with head/spinal injuries, total deaths and years of potential life lost. Road work is defined as none, construction zone, maintenance area, utility work area, missing/invalid/other. |
| Contact Person | Karl Finison TEL: 207-623-2555; FAX: 207-622-7086 email: kfinison@mhic.org |

4.1 Crash

Injury Outcome by Apparent Contributing Factors in Single Vehicle Crashes in Maine

Karl Finison and Gary Menchen

| | |
|----------------|---|
| Scope | All persons involved in 1991 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital, and census data |
| Format | Management Report |
| Description | This management report presents by apparent contributing factor in single vehicle crashes, the total occupants, total injured, percent of total injured, total transported by EMS, total admitted to a hospital, total with severe injury ISS>15, total charges, total with head/spinal injuries, total deaths and years of potential life lost. Results are shown separately for thirty different apparent contributing factors. |
| Contact Person | Karl Finison TEL: 207-623-2555; FAX: 207-622-7086 email: kfinison@mhic.org |

Injury Outcome by Apparent Contributing Factors in Multiple Vehicle Crashes in Maine

Karl Finison and Gary Menchen

| | |
|----------------|---|
| Scope | All persons involved in 1991 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital, and census data |
| Format | Management Report |
| Description | This management report presents by apparent contributing factor in multiple vehicle crashes, the total occupants, total injured, percent of total injured, total transported by EMS, total admitted to a hospital, total with severe injury ISS>15, total charges, total with head/spinal injuries, total deaths and years of potential life lost. Results are shown separately for thirty different apparent contributing factors. |
| Contact Person | Karl Finison TEL: 207-623-2555; FAX: 207-622-7086 email: kfinison@mhic.org |

4.2 Vehicle Characteristics

Studies

Assessing Crash Severity through Vehicle Damage, Point of Damage on Vehicle, Number of Vehicles in Crash, Posted Speed and Impact Speed in Utah

J. Michael Dean

| | |
|----------------|--|
| Scope | All persons involved in 1991 motor vehicle crashes in Utah |
| Data Used | Crash linked to EMS, emergency department and hospital data |
| Format | Study |
| Description | This study compared several measures as surrogates for crash severity, including “totaled” or “not totaled.” |
| Contact Person | Pat Nechodom TEL: 801-581-6410; FAX: 801-581-8686 email: pat.nechodom@hsc.utah.edu |

Management Reports

Injury Outcome by Vehicle Type for Crashes in Maine

Maine CODES Board of Directors

| | |
|----------------|--|
| Scope | All persons involved in 1995 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital, and census data |
| Format | Management Report |
| Description | This management report presents by type of vehicle, the total vehicles involved, total persons involved, total and percent injured, observed expected ratio, total transported by EMS, total hospitalized, total hospital days, total hospital charges, total with head injury, total fatalities, and years of potential life lost. Vehicle type defined as an passenger cars, vans/light trucks, motorbikes, school bus, commercial trucks, bicycles, pedestrians, other/unknown. |
| Contact Person | Cathy St. Pierre TEL: 207-624-5467; FAX: 207-624-5470 email: cathy.s.stpierre@state.me.us |

4.1 Crash/4.2 Vehicle

Injury Outcome by Type of Emergency Vehicle Involved in Crash in Maine

Karl Finison and Gary Menchen

| | |
|----------------|--|
| Scope | All persons involved in 1991 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital, and census data |
| Format | Management Report |
| Description | This management report presents by type of emergency vehicle involved at crash the total occupants, total injured, percent of total injured, total transported by EMS, total admitted to a hospital, total with severe injury ISS>15, total charges, total with head/spinal injuries, total deaths and years of potential life lost. Emergency vehicle involved is defined as no, police vehicle, ambulance, fire department, wrecker (enroute), other, missing/invalid. |
| Contact Person | Karl Finison TEL: 207-623-2555; FAX: 207-622-7086 email: kfinison@mhic.org |

4.3 Person Characteristics

4.3.1 Safety Belts

Studies

Report to Congress on Benefits of Safety Belts and Motorcycle Helmets, Based on Data from the Crash Outcome Data Evaluation System (CODES)

National Highway Traffic Safety Administration (1996).

| | |
|----------------|---|
| Scope | All occupants of police reported crashes statewide for 1990, 1991, or 1992 in Hawaii, Maine, Missouri, New York, Pennsylvania, Utah, Wisconsin |
| Data Used | Statewide crash linked to EMS, hospital, and other state data by seven states and the state results statistically combined by NHTSA |
| Format | Study |
| Description | Occupant-specific, population-based outcome information used to evaluate the effectiveness of safety belts and motorcycle helmets in terms of mortality, morbidity, severity, and cost. |
| Contact Person | Dennis Utter, NHTSA TEL: 202-366-5351, FAX: 202-366-7078 |

4.2 Vehicle/4.3.1 Safety Belts

NHTSA Technical Report: The Crash Outcome Evaluation System (CODES)

Johnson, Sandra W. and Walker, Jonathan

| | |
|----------------|--|
| Scope | All occupants of police reported crashes statewide for 1990, 1991, or 1992 in Hawaii, Maine, Missouri, New York, Pennsylvania, Utah, Wisconsin |
| Data Used | Statewide crash linked to EMS, hospital, and other state data by seven states and the state results statistically combined by NHTSA |
| Format | Study |
| Description | Includes technical information about the probabilistic linkage and state specific results as background reference for the <i>Report to Congress on the Benefits of Safety Belts and Motorcycle Helmets</i> . |
| Contact Person | Sandra Johnson, NHTSA TEL: 202-366-5364, FAX: 202-366-7078 |

Outcomes and Costs Associated with Seat Belt and Helmet Use in Maine. (in process)

| | |
|----------------|---|
| Scope | All persons involved in 1995-1996 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS and hospital data |
| Format | Study |
| Description | This analysis will replicate using 1995-1996 the NHTSA mandated seat belt analysis previously done with 1991 data for the Report to Congress. Outcomes will include levels of injury as before. An evaluation of hospitalization or death from head injuries will be added. |
| Contact Person | Cathy St. Pierre TEL: 207-624-5467; FAX: 207-624-5470 email: cathy.s.stpierre@state.me.us |

4.3.1 Safety Belts

Safety Belts and Head and Spinal Injuries in Maine

Karl Finison, Christiana Cook, Gary Menchen, and Douglas Thompson

| | |
|----------------|--|
| Scope | All persons involved in 1991 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital, and census data |
| Format | Study |
| Description | This study measured the effectiveness of safety belts to reduce the risk for head and spinal injuries using three outcome measures: reported by police, reported by EMS, or reported by hospital. Study populations included occupants of cars and light trucks. |
| Contact Person | Karl Finison TEL: 207-623-2555; FAX: 207-622-7086 email: kfinison@mhic.org |

Within Vehicle Analysis of the Effectiveness of Seat Belts in Maine

Douglas Thompson

| | |
|----------------|--|
| Scope | All persons involved in 1991 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital, and census data |
| Format | Study |
| Description | This within-vehicle analysis used conditional logistic regression to determine whether alternative analytic techniques led to similar conclusions as those prepared using NHTSA's mandated CODES model. This type of analysis provided more control for the circumstances and severity of the crash than is possible based on measured variables, and generates estimates that may be more easily aggregated across states than estimates based on standard unconditional logistic regression. |
| Contact Person | Karl Finison TEL: 207-623-2555; FAX: 207-622-7086 email: kfinison@mhic.org |

4.3.1 Safety Belts

Application of Ordered Logistic Regression to Evaluate the Efficacy of Seat Belts and Helmets for Prevention of Injury in Maine

Christiana Cook

| | |
|----------------|--|
| Scope | All persons involved in 1991 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital, and census data |
| Format | Study |
| Description | An ordered logistic regression model was used to obtain greater power to reject the null hypothesis (belts or helmets are not effective) when it is false than that provided by the NHTSA mandated model. Results indicate that the new model was better for the helmet analysis but not the safety belt analysis. |
| Contact Person | Karl Finison TEL: 207-623-2555; FAX: 207-622-7086 email: kfinison@mhic.org |

Unsafe Driving Behaviors and Hospitalization in Missouri.

Mark Van Tuinen

| | |
|----------------|---|
| Scope | All drivers involved in 1990 motor vehicle and motorcycle crashes statewide in Missouri |
| Data Used | Crash linked to EMS, emergency department, hospital and insurance claims data |
| Format | Study |
| Description | This study presents Missouri specific results about the effectiveness of safety belts and motorcycle helmets on reducing the need for hospitalization as the result of a motor vehicle crash. |
| Contact Person | Mark Van Tuinen TEL: 573-751-6274; FAX: 573-526-4102 email: vantum@mail.health.state.mo.us |

4.3.1 Safety Belts

Analysis of Seat Belt Usage on Motor Vehicle Crash-Related Injuries in Utah Using a Model of Injury Severity Based Upon EMS Interventions

J. Michael Dean, Jim Reading, Pat Nechodom

| | |
|----------------|---|
| Scope | All persons involved in 1991 motor vehicle crashes statewide in Utah |
| Data Used | Crash linked to EMS data |
| Format | Study |
| Description | This study describes the relationship of safety belt use and need for specific EMS treatments. Two models of injury severity based upon EMS interventions were developed to evaluate the effects of seat belt usage on crash related characteristics which affect injury severity. Data were analyzed using logistic regression. Results show that more serious EMS treatments (e.g., bleeding control, cervical immobilization, intravenous placement, oxygen therapy, spinal immobilization, and ventilation) were less likely in belted occupants who had an EMS response. |
| Contact Person | Pat Nechodom TEL: 801-581-6410; FAX: 801-581-8686\ email: pat.nechodom@hsc.utah.edu |

Improper Use of Shoulder Straps in Motor Vehicle Crashes: A Statewide Analysis of Restraint Efficacy in Utah

Stacey Knight, Lawrence J. Cook, James C. Reading, Pat Nechodom, J. Michael Dean

| | |
|----------------|--|
| Scope | Drivers and front seat occupants with known injuries and over the age of 11 without an airbag deployed in passenger cars and light van/trucks involved in a crash during 1994-1996 in Utah. |
| Data Used | Crash linked to hospital data |
| Format | Study |
| Description | This study evaluated the effectiveness of shoulder belts used without lap belts. A stochastic simulation was used to randomly change belt use of shoulder and lap and lap belted occupants to not belted and shoulder belted to adjust for the differential misclassification of seatbelt usage due to self-reporting. Results indicate that use of the lap belt is crucial for preventing injury and death. |
| Contact Person | Pat Nechodom TEL: 801-581-6410; FAX: 801-581-8686\ email: pat.nechodom@hsc.utah.edu |

4.3.1 Safety Belts

Fact Sheets

1996 Crash Fact Sheet: Seat Belt Facts in Utah

Amy Lightfoot, Stacey Knight, Larry Cook, Pat Nechodom

| | |
|----------------|--|
| Scope | All persons involved in 1996 motor vehicle crashes statewide in Utah |
| Data Used | Crash linked to hospital inpatient data |
| Format | Annual Crash Report |
| Description | This one page fact sheet compares belted and unbelted rates for drivers and children in the same vehicle. Information is provided comparing the belted and unbelted by variations in risk, hospital days and average inpatient charges. Data is presented showing the percent belt use by age, the potential dollars saved by belt use, and belt use rates for traffic-related fatalities. |
| Contact Person | Pat Nechodom TEL: 801-581-6410; FAX: 801-581-8686 email: pat.nechodom@hsc.utah.edu |

Management Reports

Injury Outcome by Safety Equipment Usage for Persons Involved in Crashes in Maine

Maine CODES Board of Directors

| | |
|----------------|--|
| Scope | All persons involved in 1995 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital, and census data |
| Format | Management Report |
| Description | This management report presents by safety equipment usage the total persons involved, total and percent injured, the observed expected ratio, total transported by EMS, hospitalized, hospital days, hospital charges, head injury, fatals, and years of potential life lost. Safety equipment usage is defined as restraining device installed used or not used, not installed, child restraint used, air bags, helmet use, helmet not used, child restraint not used, child restraint used incorrectly, air bag deployed with seat belts used, unknown, not coded. |
| Contact Person | Cathy St. Pierre TEL: 207-624-5467; FAX: 207-624-5470 email: cathy.s.stpierre@state.me.us |

4.3.1 Safety Belts

Injury Outcome by Position in Vehicle Involved in Crashes in Maine

Maine CODES Board of Directors

| | |
|----------------|--|
| Scope | All persons involved in 1995 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital, and census data |
| Format | Management Report |
| Description | This management report presents by position in vehicle the total persons involved, total and percent injured, the observed expected ratio, total transported by EMS, hospitalized, hospital days, hospital charges, head injury, fatalities, and years of potential life. Position in vehicle is defined as driver, middle front, right front, left rear, middle rear, right rear, rear compartment, hanging on, MC bike driver, MC bike passenger, MC bike side car hang on, not coded. |
| Contact Person | Cathy St. Pierre TEL: 207-624-5467; FAX: 207-624-5470 email: cathy.s.stpierre@state.me.us |

Injury Outcome by Number of People in Cars and Light Trucks Involved in Crashes in Maine

Karl Finison and Gary Menchen

| | |
|----------------|---|
| Scope | All persons involved in 1991 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital, and census data |
| Format | Management Report |
| Description | This management report presents by number of people in cars and light trucks involved in the crash the total occupants, total injured, percent of total injured, total transported by EMS, total admitted to a hospital, total with severe injury ISS>15, total charges, total with head/spinal injuries, total deaths, years of potential life lost and the relative risk. Number of people in crash and light trucks is defined as 1 occupant, 2 occupants, 3 occupants, 4 occupants, 5+ occupants, unknown/not in vehicle. |
| Contact Person | Karl Finison TEL: 207-623-2555; FAX: 207-622-7086 email: kfinison@mhic.org |

4.3.1 Safety Belts

Injury Outcome By Type of Ejection for Crashes in Maine

Maine CODES Board of Directors

| | |
|----------------|--|
| Scope | All persons involved in 1995 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital, and census data |
| Format | Management Report |
| Description | This management report presents by type of ejection from vehicle, the total persons involved, total and percent injured, the observed expected ratio, total transported by EMS, hospitalized, hospital days, hospital charges, head injury, fatalities, and years of potential life lost. Ejection levels are defined as not ejected, partially ejected, ejected, trapped-extricated, not coded. |
| Contact Person | Cathy St. Pierre TEL: 207-624-5467; FAX: 207-624-5470 email: cathy.s.stpierre@state.me.us |

4.3.2 Child Safety Seats

Studies

Child Safety Seat Effectiveness in Pennsylvania

Michael Allen and Harold (Hank) Weiss

| | |
|----------------|---|
| Scope | Child (under age four) occupants of passenger cars and light trucks involved in 1994 crashes statewide in Pennsylvania |
| Data Used | Crash linked to EMS and hospital discharge data statewide |
| Format | Study |
| Description | This study reports on the effectiveness of child safety seats in reducing total and average hospital costs, mortality, and morbidity from motor vehicle crashes. Child safety seats are evaluated in terms of reduced mortality, injury and hospital charges. Co-variables that are controlled for include seat position, age, sex, type of vehicle and type of crash. Safety seats were found to be highly effective in mitigating injury outcomes and child safety seat usage was found to decline with the age of the child. |
| Contact Person | Hank Weiss TEL: 412-648-2600; FAX: 412-648-8924 email: hweiss@injurycontrol.com |

4.3.1 Safety Belts/4.3.2 Child Safety Seats

4.3.3 Helmet Utilization

Studies

Head Injuries Associated with Motorcycle Use in Wisconsin

Trudy Karlson and Charles Quade

| | |
|----------------|---|
| Scope | All riders involved in 1991 motorcycle crashes statewide |
| Data Used | Crash linked to hospital data |
| Format | Study |
| Description | This study uses linked crash and hospital data to evaluate the effect of motorcycle helmet use on specific brain injuries. Brain injuries were defined from ICD-9-CM codes to include all cases indicating intracranial injury. |
| Contact Person | Martha Florey TEL: 608-266-3557; FAX: 608-267-0441 email: mflorey@mail.state.wi.us |

Injuries and Costs Associated with Failure to Use Motorcycle Helmets in Missouri

Mark Van Tuinen

| | |
|----------------|---|
| Scope | All riders involved in 1990 motorcycle crashes statewide in Missouri |
| Data Used | Crash linked to EMS, emergency department, hospital and insurance claims data |
| Format | Study |
| Description | This study presents Missouri specific results of the effectiveness of motorcycle helmets on injuries and costs. |
| Contact Person | Mark Van Tuinen TEL: 573-751-6274; FAX: 573-526-4102 email: vantum@mail.health.state.mo.us |

4.3.3 Helmets

4.3.4 Alcohol and Drug Use

Studies

Medical Impact of Alcohol Related Crashes in Utah

Stacey Knight, Pat Nechodom, J. Michael Dean

| | |
|----------------|---|
| Scope | All persons involved in 1991 motor vehicle crashes statewide in Utah |
| Data Used | Crash linked to EMS, emergency department, and hospital data |
| Format | Study |
| Description | This study used linked data to assess the severity of injury and medical costs of individuals involved in an alcohol related crash. Alcohol related crashes resulted in more severe injuries and a higher cost per crash than non-alcohol related crashes. Occupants involved in alcohol related crashes were more likely to require medical care including outpatient services, EMS transport including the more extreme EMS interventions, and inpatient medical care. The study reports the average medical costs by county for alcohol and non-alcohol related crashes. |
| Contact Person | Pat Nechodom TEL: 801-581-6410; FAX: 801-581-8686; email: pat.nechodom@hsc.utah.edu |

DUI Drivers Having Action Taken Against Their Driver's License by Medical Assistance Required in Utah

Pat Nechodom

| | |
|----------------|--|
| Scope | All persons involved in 1991-1992 vehicle crashes statewide in Utah |
| Data Used | Crash linked to EMS, emergency department, and hospital data |
| Format | Management Report |
| Description | This management report compares the action taken against DUI drivers not entering the health care system with those who are transported by EMS, treated in the emergency department or admitted as an inpatient. A similar comparison is performed by police reported level of severity (no injury, possible, injury, bruises/abrasion, broken bones/bleeding. Fewer drivers with injuries had action taken for the DUI. |
| Contact Person | Pat Nechodom TEL: 801-581-6410; FAX: 801-581-8686 email: pat.nechodom@hsc.utah.edu |

4.3.4 Alcohol

Evaluation of Cited Impaired Drivers in Utah

Pat Nechodom, Stacey Knight, Stephen Hartsell

| | |
|----------------|---|
| Scope | All persons involved in 1991-1992 vehicle crashes statewide in Utah |
| Data Used | Crash linked to EMS, emergency department, and hospital data |
| Format | Study |
| Description | This study evaluated the action taken against DUI drivers who required no medical care, were transported by EMS, received hospital outpatient care, or were admitted as a hospital inpatient. Civil action was defined as no action, license suspended, license revoked. Impaired drivers admitted as inpatients were 5.2 times less likely to have civil actions taken on their driver licenses. |
| Contact Person | Pat Nechodom TEL: 801-581-6410; FAX: 801-581-8686 email: pat.nechodom@hsc.utah.edu |

Management Reports

Injury Outcome in Alcohol-Related Crashes in Maine

Karl Finison and Gary Menchen

| | |
|----------------|--|
| Scope | All persons involved in 1991 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital, and census data |
| Format | Management Report |
| Description | This management report presents the injury outcome for alcohol and non-alcohol related crashes including the total occupants, total injured, total transported by EMS, total admitted to a hospital, total with severe injury ISS>15, total charges, total with head/spinal injuries, total deaths, total years of potential life lost, and relative risk of injury. |
| Contact Person | Karl Finison TEL: 207-623-2555; FAX: 207-622-7086 email: kfinison@mhic.org |

4.3.4 Alcohol

Injury Outcome for Pedestrians/Bicyclists Involved in Alcohol Related Crashes by Apparent Physical Condition of Driver in Maine

Karl Finison and Gary Menchen.

| | |
|----------------|---|
| Scope | All persons involved in 1991 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital, and census data |
| Format | Management Report |
| Description | This management report presents for pedestrians/bicyclists involved in alcohol related crashes by apparent physical condition of the driver the injury outcome including the total involved, total injured, percent of total injured, total transported by EMS, total admitted to a hospital, total with severe injury ISS>15, total charges, total with head/spinal injuries, total deaths and total years of potential life lost. Data are reported by apparent physical condition of the driver. Apparent physical condition is defined as normal, under the influence, had been drinking, had been using drugs, asleep, fatigued, ill, handicapped, other, missing/invalid. |
| Contact Person | Karl Finison TEL: 207-623-2555; FAX: 207-622-7086 email: kfinison@mhic.org |

Injury Outcome by Apparent Physical Condition of Driver in Single Vehicle Crashes in Maine

Karl Finison and Gary Menchen.

| | |
|----------------|---|
| Scope | All persons involved in 1991 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital, and census data |
| Format | Management Report |
| Description | This management report presents by apparent physical condition for driver in single vehicle crash including the total occupants, total injured, percent of total injured, total transported by EMS, total admitted to a hospital, total with severe injury ISS>15, total charges, total with head/spinal injuries, total deaths and total years of potential life lost. Apparent physical condition is defined as normal, under the influence, had been drinking, had been using drugs, asleep, fatigued, ill, handicapped, other, missing/invalid. |
| Contact Person | Karl Finison TEL: 207-623-2555; FAX: 207-622-7086 email: kfinison@mhic.org |

4.3.4 Alcohol

4.3.5 Driver Licensing

Studies

Graduated Licensing: Using Linked Data to Evaluate Its Medical and Financial Impact in Utah

Pat Nechodom

| | |
|----------------|--|
| Scope | All persons involved in 1991-1994 motor vehicle crashes statewide in Utah |
| Data Used | Crash linked to EMS, emergency department, and hospital data |
| Format | Presentation Overheads |
| Description | This presentation presents results of a study that demonstrates the need for graduated licensing (21 year old in front seat and belts required for 16-19 year old drivers) for young drivers. Linked data were used to show that young drivers driving to and from school with fellow students in the car were more likely to be involved in a crash and to not wear seat belts. The linked data also were used to determine the inpatient and outpatient charges that would be saved if young drivers did not drive to school with their friends. The results indicate that among this group, the passengers are more likely to be injured than the driver. |
| Contact Person | Pat Nechodom TEL: 801-581-6410; FAX: 801-581-8686 email: pat.nechodom@hsc.utah.edu |

Evaluating Drivers Licensed with Medical Conditions in Utah, 1992-1996

Edma Diller, Lawrence Cook, Dan Leonard, J. Michael Dean, James Reading, Donald Vernon

| | |
|----------------|--|
| Scope | All persons involved in 1992-1996 motor vehicle crashes statewide in Utah |
| Data Used | Crash data and death certificates linked to master driver license file |
| Format | Study |
| Description | This study compares the crash and citation rates of drivers with medical conditions to drivers without medical conditions. The drivers without medical conditions were chosen randomly from the general driving population and matched on age group, gender and county of residence to the drivers with medical conditions. Unrestricted drivers with medical conditions had higher crash and citation rates compared to their corresponding control groups. Limitations of the results are discussed. |
| Contact Person | Pat Nechodom TEL: 801-581-6410; FAX: 801-581-8686 email: pat.nechodom@hsc.utah.edu |

4.3.5 Driver Licensing

5.0 APPLICATIONS FOR HIGHWAY SAFETY

5.1 Roadway

5.1.1 Objects in Roadway

Studies

An Evaluation of Severity and Outcome of Injury by Type of Object Struck (First Object Struck Only) for Motor Vehicle Crashes in Connecticut

Lorna Thibeault, Gerald Zuckier and Lenworth Jacobs

| | |
|----------------|--|
| Scope | All persons involved in 1995 crashes in Connecticut |
| Data Used | Crash data linked to a linked data file including emergency department, ambulatory surgery, hospital inpatient discharge, death certificate data. |
| Format | Study |
| Description | A multiple logistic regression with backward stepwise selection was used for the analysis. Outcome was defined as the frequency of first object struck, mortality, total charges, length of stay and the Injury Severity Score (ISS). Independent variables included age, gender, location of the crash, location of fixed object struck, speeding, following too closely, violating traffic controls, unsafe use of highway by pedestrian, driver illness, construction, road surface, snow , rain, drinking status of driver and , lighting conditions, type of motor vehicle, collision type, and injury classification. The linkage process, based on a deterministic algorithm, was performed prior to Connecticut's CODES funding. |
| Contact Person | Gerald Zuckier TEL: 203-294-7354; FAX: 203-284-9318 email: zuckier@chime.org |

5.1 Roadway

Modeling the Causes and Consequences of Collisions With Utility Poles in Hawaii

Karl Kim and Lei Li

| | |
|----------------|---|
| Scope | All persons involved in motor vehicle crashes occurring between 1990-1991 in Hawaii. Also includes unlinked crash data for ten year period 1986-1995. |
| Data Used | Crash data linked to EMS , hospital and medical insurance claims data. |
| Format | Study |
| Description | This study describes the characteristics of drivers, roadway and environmental features of utility pole collisions and their medical and financial outcomes utilizing linked data. Utility pole collisions are compared to vehicle-to-vehicle collisions in terms of the probability of injury using various injury scores (KABCO, ISS, AIS), and average hospital costs. Utility pole collisions are found to be more serious in terms of injury level than vehicle-to-vehicle crashes. A logistic model estimating the odds of being injured in utility pole collisions showed that the odds of injury are related to age, gender, belt use, alcohol/drugs, speed, and other characteristics. Recommendations for reducing utility pole collisions involving engineering, enforcement, and education approaches are included. |
| Contact Person | Karl Kim TEL: 808-956-7381; FAX: 808-956-6870 email: karlk@hawaii.edu |

5.1 Roadway

Crashes Involving Collisions With Fixed Objects in New York

Ann Dowling

| | |
|----------------|---|
| Scope | All persons involved in 1992-1996 motor vehicle crashes statewide in New York |
| Data Used | Crash data for 1992-1996; Crash data linked to EMS, hospital discharge data, and highway data for 1992 |
| Format | Study |
| Description | This study uses type of crash, rural/urban location, time of day, type of object struck, restraint use, type and location of injury seating position, single/multiple vehicle involvement, age, gender, type of road, number of lanes, shoulder width, total and average charge for hospitalization and length of stay to evaluate fixed object crashes in New York. Type of crash includes single vehicle/single event. Fixed objects include utility pole, tree, guide rail, earth embankment, ditch, and rock cut. |
| Contact Person | Anne Dowling TEL: 518-453-0291; FAX: 518-453-0298 adowling@global2000.net |

Using Linked Data to Evaluate Crashes Involving Fixed Objects in Pennsylvania

Michael Allen & Harold (Hank) Weiss

| | |
|----------------|--|
| Scope | All persons involved in 1994 single vehicle fixed object crashes on high speed state and Federal highways statewide in Pennsylvania |
| Data Used | Crash data used to define the fixed objects and crash circumstances; Crash/EMS/Hospital data used to define injury severity; Hospital data to define costs. |
| Format | Study |
| Description | This study focuses on the injury risks posed by trees and utility poles in Pennsylvania. Injury outcome is measured in terms of the risk of death, major injury, hospital charges and vehicle deformation. Trees were found to pose a substantially higher injury risk than utility poles. |
| Contact Person | Hank Weiss TEL: 412-648-2600; FAX: 412-648-8924 email: hweiss@injurycontrol.com |

5.1 Roadway

Management Reports

Injury Outcome for Crashes Involving Moose, Deer or Other/Unknown in Maine

Karl Finison and Gary Menchen.

| | |
|----------------|---|
| Scope | All persons involved in 1991 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital and Department of Inland and Fisheries and Wildlife data |
| Format | Management Report |
| Description | This management report indicates for persons in crashes involving an animal total occupants involved in the crash, total injured, total transported by EMS, total admitted to a hospital, percent of the total injured, and the average hospital charge. Animal type was defined as moose, deer, and other. |
| Contact Person | Karl Finison TEL: 207-623-2555; FAX: 207-622-7086 email: kfinison@mhic.org |

5.1.2 Crash Analysis by Roadway

Studies

1995 Loudon Road Crash Study for Concord Police Department in New Hampshire

Tom Hettinger

| | |
|----------------|--|
| Scope | All persons involved in 1995 that occurred on Loudon Road in Concord, New Hampshire. |
| Data Used | Crash data linked to EMS and emergency department data. |
| Format | Study |
| Description | This study provides an in depth analysis of the characteristics of crashes that occurred on Loudon Road in Concord, New Hampshire during 1995. Linked data were used to calculate the average emergency department charge for all injuries treated, for victims using restraints/helmets and for those not using them. |
| Contact Person | Tom Hettinger TEL: 603-271-4568; FAX: 603-271-4567 email: thetting@dhhs.state.nh.us |

5.1 Roadway

6.0 APPLICATIONS FOR EMS

6.1 Occurrence of EMS Transports

Studies

Geographic Information System for Emergency Medical Services Analysis in Hawaii

Lawrence Nitz, Karl E. Kim, Donna Maiava

| | |
|----------------|---|
| Scope | All persons involved in 1990 motor vehicle crashes in Hawaii |
| Data Used | Crash linked to EMS, emergency department, hospital and insurance claims data |
| Format | Study |
| Description | Mapping and spatial data sources are described in the context of applications to analysis of location characteristics of EMS runs. Analyses of point, segment, and areal aspects of EMS calls for young drivers, motorcyclists, victims of utility pole and bus/pedestrian crashes and cardiac emergencies that have application to EMS and transportation policy planning are presented. |
| Contact Person | Karl Kim TEL: 808-956-7381; FAX: 808-956-6870 email: karlk@hawaii.edu |

Characterization of EMS Transports Related to Motor Vehicle Crashes in Utah, 1991

J. Michael Dean, Pat Nechodom, Donald D. Vernon, Larry Cook, Jim Reading

| | |
|----------------|---|
| Scope | All persons involved in 1991 motor vehicle crashes statewide in Utah |
| Data Used | Crash linked to EMS, emergency department and hospital discharge data |
| Format | Study |
| Description | EMS transports from motor vehicle crashes in Utah during 1991 described by mode of emergency transport, including transported without paramedics, by single paramedic unit, by double paramedic unit, by helicopter, etc. Averages are presented for age, Glasgow Coma Scale, CRAMS score, length of stay, and hospital inpatient/outpatient charges by transport type. Total EMS transports are presented 5 year age groups by transport type. Similar information is presented for outpatient and inpatient care recipients. The study also presents county-based data including percentage of EMS linkages and incidence rates of crashes. |
| Contact Person | Pat Nechodom TEL: 801-581-6410; FAX: 801-581-8686 email: pat.nechodom@hsc.utah.edu |

6.1 EMS

Management Reports

EMS Response Times by Population Density in Maine

Karl Finison and Gary Menchen

| | |
|----------------|---|
| Scope | All persons involved in 1987 and 1991 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital, and census data |
| Format | Management Report |
| Description | This management report presents for specific EMS times (access, response, destination, total) the total EMS transports related to motor vehicle crashes, the average time by population density. Population density per square mile is defined as metro (>500), urban (101-500), suburban (51-100), rural (7-50), wilderness (<7). Data are reported for 1987 and 1991. |
| Contact Person | Karl Finison TEL: 207-623-2555; FAX: 207-622-7086 email: kfinison@mhic.org |

Severity of Injury and Average on Scene time for EMS Transports Related to Motor Vehicle Crashes in Maine

Karl Finison and Gary Menchen

| | |
|----------------|---|
| Scope | All persons involved in 1991 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS, hospital and census data |
| Format | Management Report |
| Description | This management report presents the severity of injury and average on scene time by EMS capability level. Severity is defined using the revised trauma score as <3.99, 4-6.99, 7-7.84. EMS capability level is defined as paramedic, other ALS, BLS, unknown. |
| Contact Person | Karl Finison TEL: 207-623-2555; FAX: 207-622-7086 email: kfinison@mhic.org |

7.0 APPLICATIONS FOR EVALUATING DATA QUALITY

7.1 Under/Over Reporting of Occurrence

Studies

Estimate of Police Under-Reporting of Collisions in Hawaii

Karl Kim and Lawrence Nitz

| | |
|----------------|--|
| Scope | All persons involved in 1990 motor vehicle crashes in Hawaii |
| Data Used | Crash linked to EMS , hospital and medical insurance claims data |
| Format | Study |
| Description | This study estimates the extent of police under reporting of collisions in Hawaii. Persons involved in police reported crashes (\$1000 property damage or injury) were matched to health records for persons whose cause of injury was flagged as a motor vehicle crash. Unreported crashes were defined as those health records for the motor vehicle crash victims that did not match to a crash record. Crash reports are more likely to be missing when the injuries are minor, injury symptoms do not appear until later, the victim leaves the scene before the police arrive, the police are never called, the records are lost during processing, or inaccurate data prevented the records from linking. |
| Contact Person | Karl Kim TEL: 808-956-7381; FAX: 808-956-6870 email: karlk@hawaii.edu |

Estimate of Lie Factor for Safety Belt and Alcohol Use in Hawaii

Karl Kim

| | |
|----------------|---|
| Scope | All persons involved in 1990-1991 motor vehicle crashes in Hawaii |
| Data Used | Crash linked to hospital data |
| Format | Study |
| Description | This study evaluates the differences in police and hospital reporting of safety belt and alcohol use, controlled for age, gender, vehicle type, location, crash type, and injury severity. The linked data are used to estimate differences between reporting levels and the influences of various driver, vehicle, roadway, and environmental factors. |
| Contact Person | Karl Kim TEL: 808-956-7381; FAX: 808-956-6870 email: karlk@hawaii.edu |

7.1 Under/Over Reporting

Comparative Reporting of Belt Use, Alcohol, and Type of Injury from Police, EMS, and Hospital Discharge Abstract Reports in Maine

Karl Finison

| | |
|----------------|--|
| Scope | All persons involved in 1991 motor vehicle crashes statewide in Maine |
| Data Used | Crash linked to EMS and hospital discharge data |
| Format | Study |
| Description | This study compared reported belt use between police and EMS records and between police and hospital records. It discusses the impact of the varying levels of specificity used by the police, EMS, and hospital records to define injury. EMS and hospital records indicating head and spinal trauma were compared to identify under-reporting of injuries. The results reported reinforced the view that valid reporting of the injury outcome of motor vehicle crashes can best be accomplished through the linkage of crash to hospital discharge and other medical records. |
| Contact Person | Karl Finison TEL: 207-623-2555; FAX: 207-622-7086 email: kfinison@mhic.org |

Variations in Reported Belt Use in Different State Data Files in Missouri

Mark Van Tuinen

| | |
|----------------|---|
| Scope | All persons involved in 1990 motor vehicle crashes statewide in Missouri |
| Data Used | Crash linked to EMS, emergency department, hospital and insurance claims data |
| Format | Study |
| Description | This study evaluated the advantages of using linked data to determine variations in reported belt use as recorded on the linked crash, EMS, and Head and Spinal Cord Injury/Trauma (HSCIT) files. Agreement rates were compared between the linked crash and EMS and the linked crash and HSCIT files. Average charges were studied to assess the affect of the disagreements in the three files. |
| Contact Person | Mark Van Tuinen TEL: 573-751-6274; FAX: 573-526-4102 email: vantum@mail.health.state.mo.us |

7.1 Under/Over Reporting

Over-Reporting and Measured Effectiveness of Seat Belts in Motor Vehicle Crashes in Utah

J. Michael Dean, James C. Reading, Pat Nechodom

| | |
|----------------|---|
| Scope | All persons involved in 1991 motor vehicle crashes statewide in Utah |
| Data Used | Crash linked to EMS and discharge summaries of medical records from hospitals and clinics (includes outpatient, emergency department, inpatient, and rehabilitation facilities) |
| Format | Study |
| Description | This study evaluates the effect of seat belt over-reporting (information biased differential misclassification) on the odds ratio and confidence limits relating seat belt use and injury. Independent observational studies from the same time period were used to obtain corrected odds ratios to provide more reasonable estimates of seat belt effectiveness. |
| Contact Person | Pat Nechodom TEL: 801-581-6410; FAX: 801-581-8686 email: pat.nechodom@hsc.utah.edu |

Estimates of the Effects of Seat Belt Over-Reporting on Wisconsin Motor Vehicle Crash Analyses in Wisconsin

Trudy A. Karlson, Wayne Bigelow, Daniel Wickeham, Charles A. Quade

| | |
|----------------|---|
| Scope | All persons involved in 1991 motor vehicle crashes statewide in Wisconsin |
| Data Used | Crash linked to hospital data |
| Format | Study |
| Description | This study presents a methodology for adjusting reported belt use to prevent an overestimate of belt effectiveness. Field observation data and logit parameters for occupant, vehicle and site characteristics mapped into variables in the crash data to calculate a probability of belt use for every passenger vehicle occupant whose crash record contained sufficient vehicle, site and occupant information. A new dichotomous variable was created to assign occupants' belt use according to a new algorithm. Information obtained from a medical record review was also used to justify the new algorithm. |
| Contact Person | Martha Florey TEL: 608-266-3557; FAX: 608-267-0441 email: mflorey@mail.state.wi.us |

7.1 Under/Over Reporting

7.2 Errors in Financial Data

Studies

Linked Hospital Discharge and Head and Spinal Cord/trauma Injury Data (Hscit) to Compare Hospital Charges in Missouri

Mark Van Tuinen

| | |
|----------------|---|
| Scope | All persons involved in 1990 motor vehicle crashes statewide in Missouri |
| Data Used | Hospital linked to head and spinal cord trauma registry data |
| Format | Study |
| Description | This study identified variations in total charges reported by two different data sources of victims injured in motor vehicle crashes. Records for patients not included in both data sources were compared according to emergency department discharge to the operating room and ICU units, length of stay, total charges, discharge to skilled nursing facility and rehab unit, fatality, superficial injuries, etc. The variations were evaluated to explain differences in the average charge generated by each data source. |
| Contact Person | Mark Van Tuinen TEL: 573-751-6274; FAX: 573-526-4102 email: vantum@mail.health.state.mo.us |

The Effects of Data Outliers and Errors in Hospital Charges on Conclusions Regarding the Efficacy of Safety Belt Use in Missouri

Mark Van Tuinen

| | |
|----------------|---|
| Scope | All persons involved in 1990 motor vehicle crashes statewide in Missouri |
| Data Used | Hospital linked to head and spinal cord trauma registry data |
| Format | Study |
| Description | This study evaluated the effects of data outliers and errors in hospital charges on the analysis of the effectiveness of safety belts. The potential that very high charges increase the variability of the data, making it harder to test for differences in any effect is discussed and recommendations are made. |
| Contact Person | Mark Van Tuinen TEL: 573-751-6274; FAX: 573-526-4102 email: vantum@mail.health.state.mo.us |

7.2 Errors in Financial Data

7.3 Developing State Data

Studies

Developing Statewide Emergency Department Data in Pennsylvania

Harold B. Weiss

| | |
|----------------|---|
| Scope | 1991 Emergency Department Data |
| Data Used | Stratified sample of emergency department billing records from hospitals in Pennsylvania |
| Format | Study |
| Description | This study reports on the use of computerized ED patient registration, billing and log systems integrated systems using the UB-92 uniform billing format to create a statewide emergency department data base. It discusses the permanent storage of data in a computer-retrievable format, the inclusion of diagnostic and treatment information, and the likelihood for standardization of patient data for later merging at the state level. |
| Contact Person | Hank Weiss: TEL: 412-648-2600; FAX: 412-648-8924 email: hweiss@injurycontrol.com |

7.4 Validating the Linkage

Studies

Identifying Records That Should Have Linked but Did Not, and Comparing Them to Records That Did Link in Missouri

Mark Van Tuinen

| | |
|----------------|---|
| Scope | All persons involved in 1990 motor vehicle crashes statewide in Missouri |
| Data Used | Crash linked to EMS, emergency department, hospital and insurance claims data |
| Format | Study |
| Description | This study compared records that should have linked but did not and records that did link using the presence of linkage identifiers and the linkage methodology. The impact of the addition of the unlinked records was evaluated by comparing average charges and admission rates. |
| Contact Person | Mark Van Tuinen TEL: 573-751-6274; FAX: 573-526-4102 email: vantum@mail.health.state.mo.us |

7.3 Developing State Data/7.4 Validation

Comparing Linkage Methods: Ad Hoc Linkage Versus Probabilistic Linkage in Missouri
Mark Van Tuinen

| | |
|----------------|--|
| Scope | All persons involved in 1990 motor vehicle crashes statewide in Missouri |
| Data Used | Crash linked to EMS, emergency department, hospital and insurance claims data |
| Format | Study |
| Description | This study compares the linkage of HSCI (Head and Spinal Cord Injury) and HD (Hospital Discharge) records using an Ad Hoc or Probabilistic Linkage method. The impact of the different linkage methods was evaluated using severity and the effectiveness of safety belts and helmets. |
| Contact Person | Mark Van Tuinen TEL: 573-751-6274; FAX: 573-526-4102 email: vantum@mail.health.state.mo.us |

Comparison of Two Hospital Data Files Using the Capture-Recapture Formula in Missouri
Mark Van Tuinen

| | |
|----------------|---|
| Scope | All persons involved in 1990 motor vehicle crashes statewide in Missouri |
| Data Used | Crash linked to EMS, emergency department, hospital and insurance claims data |
| Format | Study |
| Description | To correct for suspected under-reporting, the State Hospital Discharge File (HD) was compared to its Head and Spinal Cord Injury File (HSCI) using probabilistic linkage. Missing data rates were calculated for each file and each file was updated accordingly. |
| Contact Person | Mark Van Tuinen TEL: 573-751-6274; FAX: 573-526-4102 email: vantum@mail.health.state.mo.us |

7.4 Validation

Technical Report on New Mexico CODES Data Linkage for 1995

Carrie Rudd

| | |
|----------------|--|
| Scope | All persons involved in 1995 crashes statewide in New Mexico |
| Data Used | Crash linked to trauma registry, hospital discharge, Medicaid, and statewide coroner's data |
| Format | Report |
| Description | This report describes the process New Mexico followed to link the data files. It also includes results of the linkage and validation of the matched pairs. |
| Contact Person | Stuart Castle TEL:505-827-1435; FAX: 505-827-0013 email: stuartc@doh.state.nm.us |

Motor Vehicle Record Designating "No Injury" Which Subsequently Linked with Injury Records in Utah.

Stacey Knight, Pat Nechodom, Jim Reading, J. Michael Dean

| | |
|----------------|---|
| Scope | All persons involved in 1991 motor vehicle crashes statewide in Utah |
| Data Used | Crash linked to EMS, emergency department, and hospital data |
| Format | Study |
| Description | This study investigated the records of the individuals coded as sustaining "no injury" in the crash file who subsequently linked to inpatient hospital records. About twenty-eight percent of the crash victims requiring inpatient care were coded as "no injury" in the crash file. These individuals averaged more than \$16,000 in inpatient charges. The study describes this population in terms of its case mix by ICD-9-CM codes, ISS scores, seating position, and EMS care. This analysis identified potential invalid matches. Results were also calculated for each county. |
| Contact Person | Pat Nechodom TEL: 801-581-6410; FAX: 801-581-8686; email: pat.nechodom@hsc.utah.edu |

7.4 Validation

Management Reports

Injury Reported by Officer at Scene vs. Treatment Received by Crash Victim in Utah

Pat Nechodom

| | |
|----------------|---|
| Scope | All persons involved in 1991 motor vehicle crashes statewide in Utah |
| Data Used | Crash linked to EMS, emergency department, and hospital data |
| Format | Management Report |
| Description | This management report lists for each level of KABCO (no injury, possible injury, bruises and abrasions, broken bones and bleeding, fatal) the level of treatment received (none, injury without transport, transported, hospitalized, died). |
| Contact Person | Pat Nechodom TEL: 801-581-6410; FAX: 801-581-8686 email: pat.nechodom@hsc.utah.edu |

EMS Treatment Codes Compared to Police-Reported Injury Codes in Utah

Pat Nechodom

| | |
|----------------|--|
| Scope | All persons involved in 1991 motor vehicle crashes statewide in Utah |
| Data Used | Crash linked to EMS, emergency department, and hospital data |
| Format | Management Report |
| Description | This management report lists for each level of KABCO (no injury, possible injury, bruises and abrasions, broken bones and bleeding, fatal) the type of EMS treatments received (26 EMS procedures included in the list of treatments). |
| Contact Person | Pat Nechodom TEL: 801-581-6410; FAX: 801-581-8686 email: pat.nechodom@hsc.utah.edu |

8.0 GENERAL APPLICATIONS BASED ON LINKED DATA

Reports

Missouri Crash Outcome Data Evaluation System (CODES) 1993

Mark Van Tuinen

| | |
|----------------|--|
| Scope | All drivers involved in 1993 motor vehicle crashes statewide in Missouri |
| Data Used | Crash data linked to emergency room and hospital discharge data. |
| Format | Report |
| Description | This report was designed to present information not contained in the Missouri Highway Patrol's "Traffic Safety Compendium". After an introduction describing the characteristics and limitations of the data, the key findings are presented. The body of the report consists of 8 sections: Leading Causes of Death and Hospitalization, Speed Limit at the Crash Site, Safety Belt Use, Alcohol Impairment, Type of Crash, Vehicle Type, Young Drivers and Charges, Injuries and Risk Factor Summary. It has 4 appendices including a Comparison with the Traffic Safety Compendium, Summary of the Completeness and Accuracy of the Linkage Procedures, E-codes not Included in the Linked Hospital File, and Regional Planning Commission Area-County Map. |
| Contact Person | Mark Van Tuinen TEL: 573-751-6274; FAX: 573-526-4102 email: vantum@mail.health.state.mo.us |

Utah Crash Summary 1996

Edma Diller, Stacey Knight, Larry Cook, Pat Nechodom

| | |
|----------------|---|
| Scope | All persons involved in 1996 motor vehicle crashes statewide in Utah |
| Data Used | Crash linked to hospital inpatient data |
| Format | Annual Crash Report |
| Description | The format of this summary report includes outcome related information about motor vehicle crashes in Utah. Included are graphs and tables indicating percentage of crash victims hospitalized by age and gender; length of stay and hospital charges by gender, hospital charge by belt use, average hospital charges by county of crash and belt use, charge and length of stay for hospitalizations by seating position. |
| Contact Person | Pat Nechodom TEL: 801-581-6410; FAX: 801-581-8686 email: pat.nechodom@hsc.utah.edu |

Utah Crash Summary 1997

Stacey Knight, Larry Cook, Edma Diller, Amy Lightfoot, Pat Nechodom

| | |
|----------------|---|
| Scope | All persons involved in 1997 motor vehicle crashes statewide in Utah |
| Data Used | Crash linked to emergency department and hospital inpatient data |
| Format | Annual Crash Report |
| Description | The format of this summary report includes outcome related information about motor vehicle crashes in Utah for 1997. Mutually exclusive data are presented in separate reports for victims treated in the emergency department and discharged home and for victims treated in the emergency department and hospitalized. Included are graphs and tables indicating percentage of crash victims treated by age and gender; length of stay and charges by gender, charge by belt use, average charges by county of crash and belt use, charge and length of stay by seating position. |
| Contact Person | Pat Nechodom TEL: 801-581-6410; FAX: 801-581-8686 email: pat.nechodom@hsc.utah.edu |

8.0 Reports

U.S. Department
of Transportation
**National Highway
Traffic Safety
Administration**

400 Seventh St., S.W.
Washington, D.C. 20590

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